NEW YORK SEATTLE

# MOTORSHIP

*Devoted to Marine Oil Engine and Motor Vessels*

"MOTORSHIP" is entered as second-class matter at the Post-office at New York, N. Y., U. S. A., July, 1915, under the Act of March 3rd, 1879. Office of Publication, 17 Park Pl., New York, N. Y.

Issued Monthly
PRICE 25 CENTS
Domestic, $3.00 per year
Foreign, $3.50 per year

September, 1923
Vol. 8 No. 9

*EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.*

# MOTORSHIP

*PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.*

(Trade Mark Registered)

Vol. VIII New York, U. S. A., September, 1923 No. 9

(Cable Address—Freemote. New York)

# Lloyd's Reports Show Motorships' Great Gain

## *Fifty Per Cent. as Many Motorvessels as Steamers Commenced in Last Three Months*

WHEN the Shipbuilding Returns of Lloyd's Register show more than 100,000 tons gross of motorships commenced during the months of April, May and June, as compared with just about 200,000 tons gross of steamers, even the most skeptic shipowners must admit the evidence is unchallengeable that the latest and most economical type of marine machinery is fast winning its way towards supremacy.

As a measure of shipbuilding activities throughout the world, the reports issued by Lloyd's Register every three months are accepted as authoritative and unbiased. They take into account all vessels of 100 tons gross and upwards, whether built under Lloyd's survey, or under inspection of the American Bureau of Shipping, Germanische Lloyd, Bureau Veritas, Norske Veritas, etc. The reports cover every country where shipyards exist.

On steamers the figures of Lloyd's are just about perfect, but they still tend to be slightly, if unintentionally, unfavorable to motorships, due no doubt to the fact that practically all the Society's Surveyors were brought up in the steam school and some of them have not yet been able to recognize that in these days not every vessel built is a steamer. For instance, the shipbuilding figures for Japan include a number of steamships, but no credit is given in the motorship column to the motorvessels which we know are building there. Whatever discrepancy there is in the world's shipbuilding returns is figured against the motorship.

Examining the statistics issued by Lloyd's Register since September, 1921, one finds a remarkable growth in the proportion of motor tonnage that is being built. The figures themselves do not tell the story so convincingly as a diagram does, because a mass of figures cannot be staged in the mind nearly so effectively as a picture can be. We have therefore illustrated the shipbuilding figures by means of a chart drawn to scale, which can be checked by any doubting Thomas with the aid of the official statistics.

Prior to the end of September, 1921, Lloyd's Shipbuilding Returns did not present a table showing the vessels commenced in all countries during the period covered by the report. Beginning, however, with the Returns for the three months ending Dec. 31st, 1921, the new construction has been regularly reported. The table herewith shows the respective totals for steamers and motorships from each succeeding report.

Data on the laying of keels in Germany, are not included in the above figures, because no information is available concerning vessels commenced in that country. German construction only begins to show in the statistics when the vessels are launched. There are a lot of motorships building in Germany at the present time, and it is therefore probable that the proportions between steamers and motorvessels commenced during the period of the review, is about the same there as in the other countries. In case it might be contended that the absence of the German figures has an unfavorable influence upon the

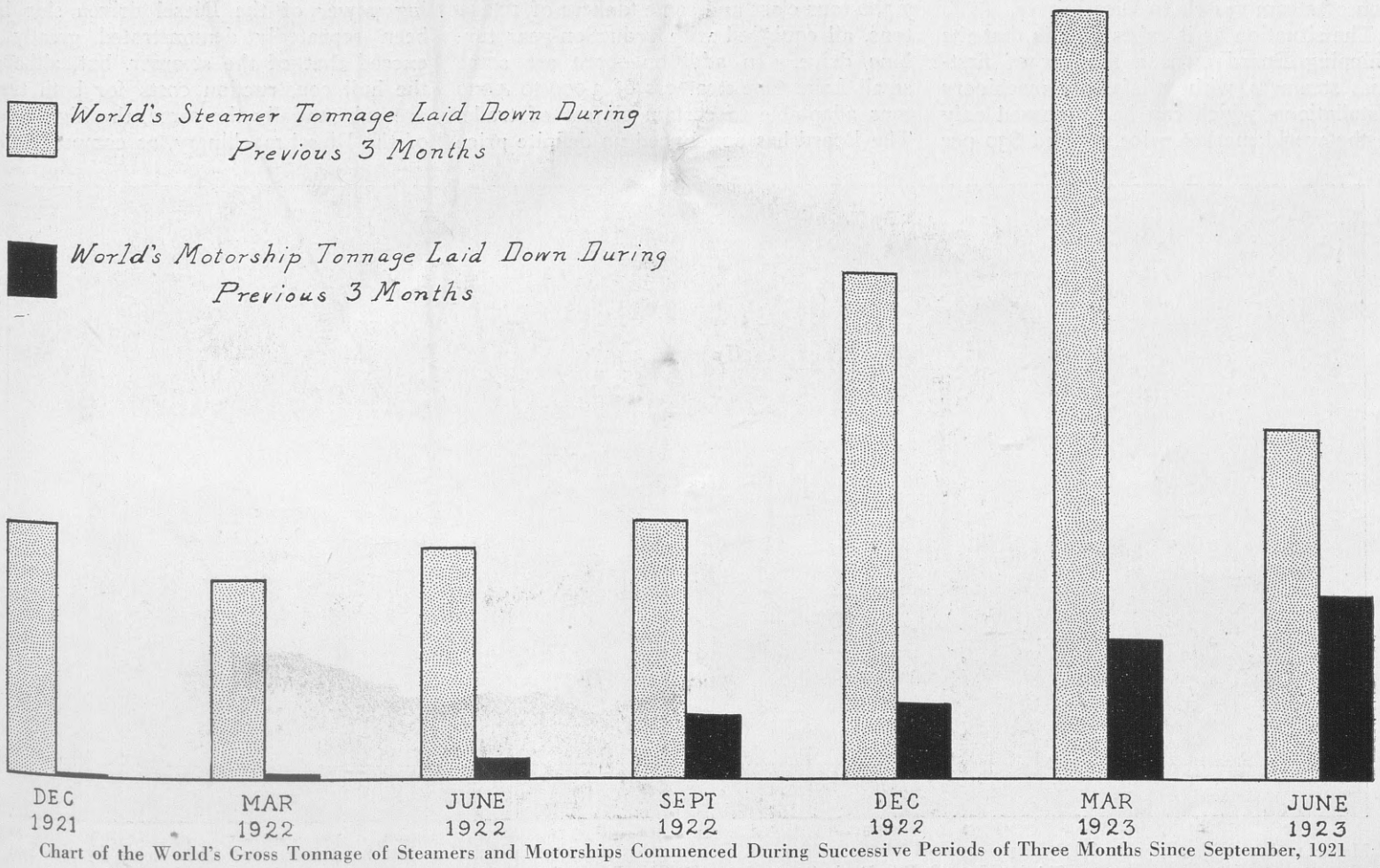



Chart of the World's Gross Tonnage of Steamers and Motorships Commenced During Successive Periods of Three Months Since September, 1921

steam proportion, we can offset it with the motorship tonnage that is constantly being added through conversion of steamers, and of which no account is taken in the tables.

There is no doubt that the statistics of new shipbuilding construction are the best and surest indication of the progress which the motorship is making. An examination of the world's total tonnage, which of course includes a large number of vesels built before the motorship era, as well as the steamers built during the time that the motorship has been in its infancy, will not present a true picture of what is being done today. Reflection will also show that the regular tables of merchant vesels under construction are not a good criterion, because they include the aggregate number of ships of nearly the whole period represented in the diagram on this page and a large amount of construction on which all work has been suspended.

LLOYD'S SHIPBUILDING RETURNS

| *Three Months Ending* | *Commenced Steamers* | *Commenced Motorships* |
|---|---|---|
| Dec. 31, 1921 | 144,195 tons gross | 730 tons gross |
| Mch. 31, 1922 | 144,725 tons gross | 1,310 tons gross |
| June 30, 1922 | 133,416 tons gross | 10,866 tons gross |
| Sept. 30, 1922 | 148,297 tons gross | 36,875 tons gross |
| Dec. 31, 1923 | 291,995 tons gross | 41,870 tons gross |
| Mch. 31, 1923 | 443,716 tons gross | 79,616 tons gross |
| June 30, 1923 | 202,515 tons gross | 107,015 tons gross |

The world's tonnage figures show mainly what shipowners were thinking from 1921 backwards. The tables of present construction throughout the world, show what shipbuilding ideas have been during the last couple of years or so. Statistics recording tonnage commenced during the last three months period indicate, however, what shipowners are thinking today, and since it is just about true that only the shrewdest people in the shipping world are building during the present depression, the present proportions under construction indicate the trend of the best brains in the shipping world today.

# Cost of Converting an 8,800 Tons S.B. Ship

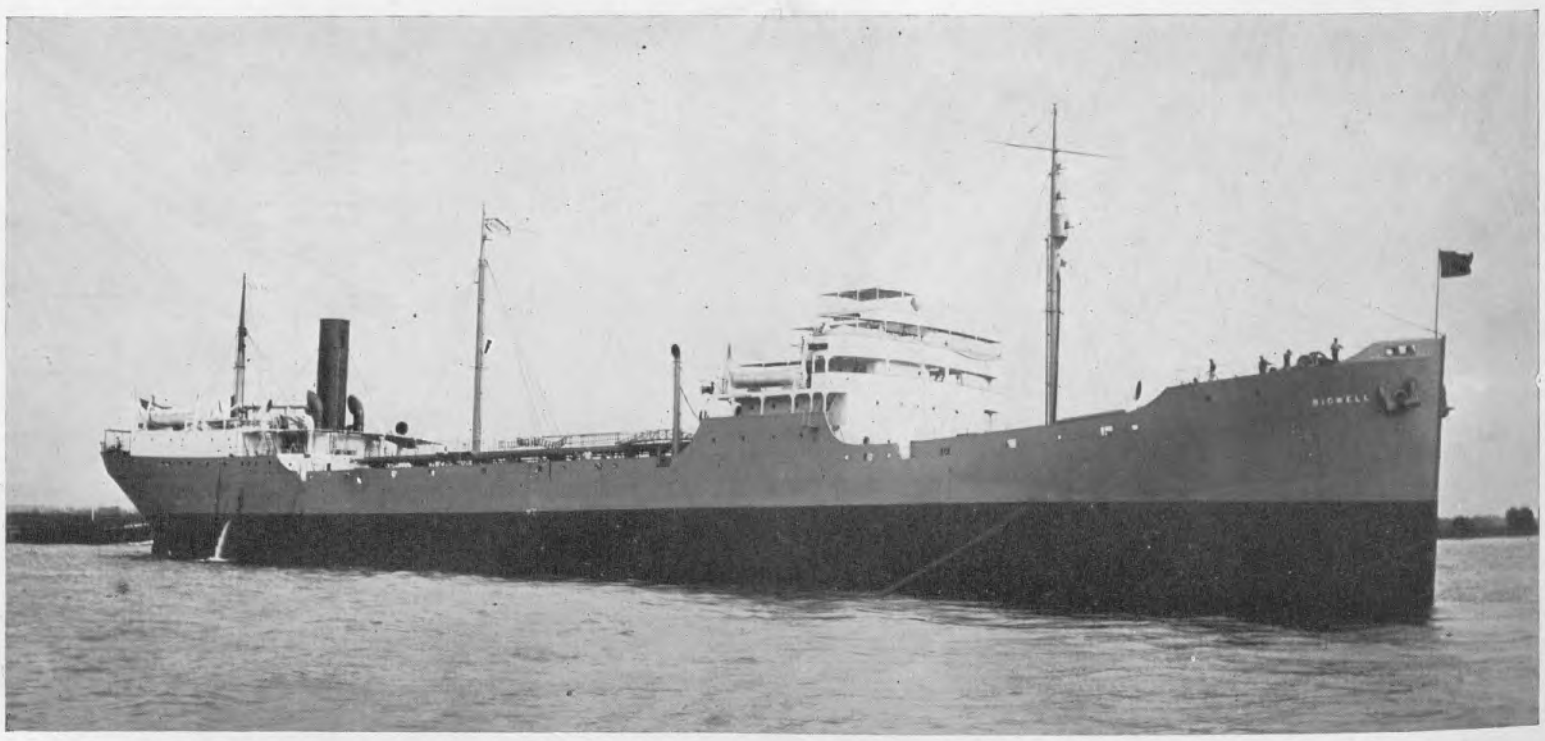
## *An Estimate of the Total Charges Necessitated in the Conversion to Diesel Power*

By LOUIS R. FORD

AFTER the great amount of discussion in shipping and Government circles concerning the ultimate disposition of the Shipping Board fleet and the numerous suggestions from various sources as to the best method of getting the Government out of the shipping business, at least one stabilizing feature is apparent. It is definitely established that the Board will not upset the tonnage market by selling its good operative steamers at nominal prices that will be practically equivalent to giving the ships away. The possibility of this sort of action has for some time acted to prevent execution of the plans that numerous shipowners have been making for investing considerable sums of money in the conversion of steam vessels to Diesel drive.

The situation as it exists now is that the Shipping Board owns a number of first-class steamers, with satisfactory machinery installations, which can be purchased only at the world market price, around $30 per deadweight ton, which it is extremely doubtful will ever be any lower. In addition to this tonnage, the Board owns several hundred vessels, the hulls of which are sound, but the war-emergency-built machinery of which is not sufficiently reliable to permit successful operation of the ships in trade. These ships include the 9,600 tons class, the 8,800 tons class—mostly built in West Coast shipyards, and for that reason known as the "West" type—the Hog Island 7,500 tons class and some tankers of 10,250 tons, all equipped with reduction-gear turbine drive. In addition there are some small Lake type steamers of 3,000 to 4,000 tons adaptable to certain classes of trade. The Board has announced no definite price for these ships, but it is pretty definitely understood that the freighters may be purchased for between $5 and $7 per deadweight ton and the tankers for $25 per deadweight ton, if the purchase is made for the purpose of removing the present machinery and installing Diesel engines.

This situation gives American shipowners an opportunity to acquire motorship tonnage at a total cost very little higher than that of equivalent steam tonnage, and very much lower than will be possible in normal times. It removes one of the serious obstacles in the way of building up a large fleet of American motorships, because it will enable the burden of fixed charges to be lightened. The gross earning power of the Diesel driven ship has been repeatedly demonstrated greatly to exceed that of the steamer, but, although the hull construction costs for both types are substantially the same, the higher cost of the Diesel machinery, as compared with



Motor tanker *Bidwell*, with 3,000 i.h.p. opposed piston engine of the Sun-Doxford type, which has just been converted from steam by the Sun Shipbuilding & Dry Dock Company at Chester, Pa., and was completed last month

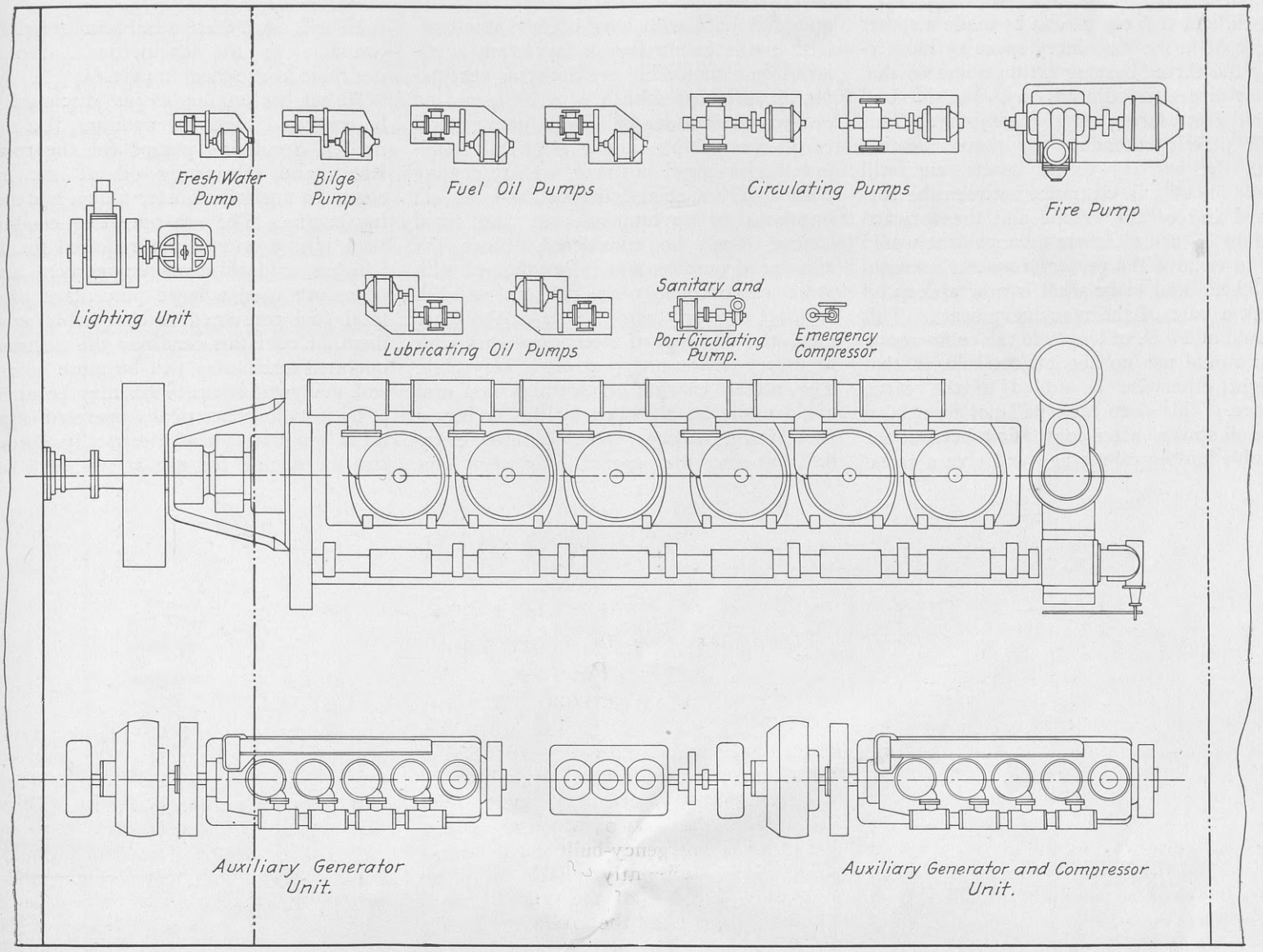



Fig. 1.—Layout of engine room in converted Shipping Board vessel, showing the use of electrically operated auxiliaries

steam machinery, increases the capital charges, and that is all the American shipowner can see.

Several other factors influence the earning power of any type of vessel, among which are the direct cost of carrying a ton of cargo, the trade route in which the vessel is operated, the kinds of cargo handled and the ability applied in the vessel's operation. The present period of keen competition and low freight rates emphasizes the importance of these factors, as is indicated by the fact that some operators are able to demonstrate superior earning capacity with motorships burdened with investment charges far in excess of those on equivalent steamers, while others are unwilling to undertake the operation of motorships purchased at very low prices.

The Diesel engine is inherently more expensive to build than the steam engine, and, although its future development will undoubtedly bring some reduction in the cost, it will never be as cheap as steam machinery. The present trend of Diesel engine prices is upward, due to increasing cost of materials.

Considering the foregoing, it seems that the present availability of Shipping Board hulls at a nominal price for conversion purposes presents to shipowners an opportunity to acquire motorship tonnage at a cost that will never be duplicated in the future, and which will give the owners an operating advantage throughout the life of the vessels. It is of interest to note at this point that a recent inspection of the large group of Shipping Board vessels laid up near Newport News, Va., disclosed the fact that they are exceptionally well cared for and in very good condition.

In planning a conversion job, the first step, of course, is for the prospective purchaser to select from the available vessels the type most suitable for his particular purposes, and the unit from this type that may seem most desirable. As a specific example, let us select one of the 8,800 tons class. Next in order is the determination of the amount of power to put into the vessel. In some cases the speed required in the service in which it is intended to operate is the controlling factor. It should be noted, however, that increasing the speed of these vessels above their present rating should not be attempted, as a very small increase above the speed for which they were designed will call for an increase of engine power out of all proportion to the results obtained. The vessels of this class are equipped with turbines of 2,500 s.h.p. and have a speed of 10 knots. In cases where the maximum possible speed is not essential, the amount of power installed will be influenced by the dimensional limitations imposed by the present machinery space. If the new machinery can be installed without moving the forward fireroom bulkhead the conversion cost will be reduced.

In considering this question of power, it should be borne in mind that the Diesel engine will sustain its rated power continuously, day after day, whereas the steam plant is subject to wide variations and seldom maintains its designed power for very long intervals. This means that on the average voyage it is not necessary that the rated Diesel power be as great as the rated steam power to enable the vessel to complete the voyage in the same length of time. When converting a 10-knot vessel with 2,500 steam h.p., a 2,000 b.h.p. Diesel engine, which would drive the ship at 9.2 knots, should be sufficient if equal results as to time of passage on moderately long voyages is desired. If a special machinery arrangement, such as Diesel electric drive or geared Diesel drive is desired, dimensional limitations will have less influence in deciding the horsepower that can be used. For the purposes of this discussion, we will assume that a 2,000 b.h.p. four-cycle engine is to be used, direct connected to the propeller shaft.

The total length of the machinery space, including engineroom and fireroom, in the vessel we are considering is 49 feet. The shortest American built engine of the power and type selected appears to be 50 ft. 9 in, over-all. The aft engineroom bulkhead is recessed 9′x10′x9′ for the thrust

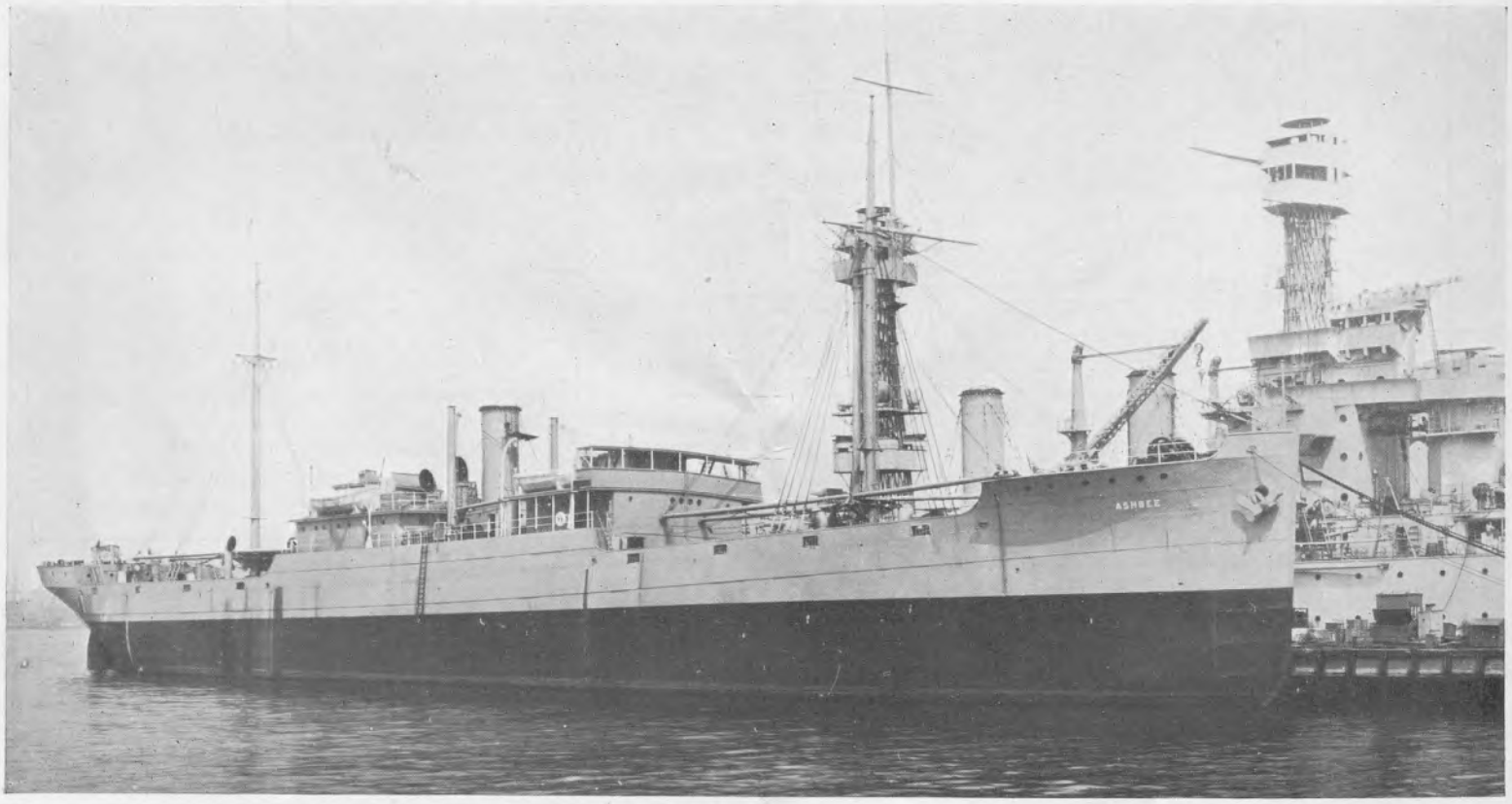
block, and this engine can be made a rather close fit in the machinery space by modifying the thrust bearing arrangement so that the flywheel is adjacent to the engine and the thrust bearing aft of the flywheel. This will permit extending the thrust bearing into the existing thrust recess, and will leave about 3 ft. clearance between the forward end of the engine and the forward bulkhead. An alternate arrangement would be to remove the present forward fireroom bulkhead and make what is now a deep oil tank a part of the machinery space. This would add 6 ft. of length to the engineroom, but would use up about 1,000 cub. ft. that might otherwise be added to the cargo space. This deep tank will not be needed for oil storage after conversion, because the double bottom oil-storage will give a cruising radius of about 100 days. A third arrangement would be to remove the spray-air compressor from the main engine and operate it with an auxiliary Diesel engine. This would shorten the main engine 7 ft. and would increase the engine power delivered to the propeller shaft, but would at the same time increase the cost of the installation. For the purpose of this discussion, we will assume that the first arrangement will be used, whereby the thrust bearing can be placed in the existing thrust recess and the forward fireroom bulkhead will not be removed.

The next step is to consider the type, number and size of auxiliaries to be used. One of the most vexing questions involved in the consideration of a conversion job is whether the steam deck winches shall be retained or be replaced by electric winches. From the operating point of view unquestionably the most satisfactory arrangement is to completely eliminate all steam auxiliaries throughout the vessel. Electrically operated auxiliaries have become standardized to the extent that today steam auxiliaries on a motorship are about as acceptable as tan shoes with a dress suit, and no one would consider building a new general cargo motorship without electrical auxiliaries. Just now, however, we are dealing with a very special condition, and the old bugaboos of investment cost and fixed charges must be considered. Since the steamer as purchased is fully equipped with steam cargo winches, the first cost of such winches is nearly zero, while, on the other hand, the first cost of electric winches with accessory wiring and controls is very high. The interest charges on this high first cost could easily be absorbed by the saving in fuel if the winches were operated every day, but since they operate only when handling cargo they will be idle and consume no fuel during the greater part of the time. Of course, there are special conditions of service which may modify this conclusion, but in the absence of such special conditions we may conclude that the existing steam winches should be retained.

In deciding upon the engineroom auxiliaries it should be borne in mind that during the time in port when the deck winches must be supplied with steam the auxiliary requirements in the engineroom are very light. During this period there will be required in the engineroom a condenser circulating pump, boiler feed pump, boiler oil feed pump, sanitary pump, fresh water pump, and a generator for supplying lights. A fire and bilge pump must be always available for use, but not running continuously. Since sufficient boiler power to operate the deck winches must be available, the extra fuel required to operate the auxiliaries enumerated will be but a very small percentage of the total port consumption, and, since these auxiliaries are already available in the engineroom, it seems desirable to use them in port.

At sea the auxiliaries just discussed will be required, and in addition there are needed circulating pumps for the cooling water and lubricating oil of the main engine, a fuel oil transfer pump, and steering engine. The sea operating condition, then, is that no steam is required for deck winches, and if steam engineroom auxiliaries are used a large percentage of the total fuel consumed is chargeable against them. Under this condition the electrically operated auxiliaries will be more economical. A good compromise may be arrived at by installing electrically operated engineroom auxiliaries and electrically operated steering engine for use at sea, with sufficient Diesel electric generator capacity to furnish them with current, and retain such of the existing steam auxiliaries as are needed for operation in port. With this arrangement the operating procedure would be to allow steam to die out at sea and operate the ship purely as a motorship with electric auxiliaries, and, upon arrival in port, raise steam in the boiler and shut down both the main and auxiliary Diesel engines. The auxiliary air compressor should be steam driven. A reduction in first cost is thus obtained, and ample assurance against breakdown is provided. The only time this auxiliary compressor will be required for pumping up starting air is when entering or leaving port or shifting berth, at which times the boiler will be under steam. The principal classification societies have ruled that such a steam operated compressor arrangement will be approved by them.

Taking up now consideration of the boiler plan, we find that some of the ships of the




M. S. *Ashbee*, which is having its steam machinery replaced by a 2,200 i.h.p. Werkspoor engine, built by the New York Shipbuilding Corp. at Camden, N. J., will be ready in about two months. U. S. S. *Colorado* in background

type under discussion are equipped with Scotch boilers, and some with water tube, the latter type of boiler being represented by several makes. Each ship has three boilers, and the total heating surface is about 8,000 sq. ft. It is thus seen that one of these boilers has a heating surface considerably in excess of what is required to furnish steam for all of the auxiliaries. Since, however, the boilers are already in the ship, the cheapest arrangement will be to retain one of them, provided it is in good condition, rather than remove all the boilers and install a smaller one. Retention of one boiler in its present location does not permit the most desirable engineroom arrangement, but since we are considering the best workable conversion that can be made for the smallest price, a compromise on this point is necessary.

It has been assumed that the most desirable plan is the one which permits letting steam in the boiler die out at sea. This will necessitate some provision for heating the living quarters when at sea in cold climates. There are several methods for providing this necessary heat, among which are electric heater, steam-electric heaters, household heating plant and exhaust heat boiler. The first system uses ordinary resistance coil in a heating element mounted on the bulkhead. The second arrangement, a British invention, utilizes in each space to be heated a steam radiator, small water reservoir and an electric heating coil, all combined in one unit. The electric coil vaporizes the water and the vapor rises into the radiator, where it is condensed and returned to the reservoir. In the third system an ordinary house heating boiler of small size is used. It may be equipped with an automatic oil burner, with thermostatic control, so that the temperature of the spaces to be heated is automatically controlled. The fourth system utilizes a small steam boiler through which the exhaust gases from the engine are passed, and so arranged that the exhaust may be bypassed when the boiler is not used. This last arrangement is most satisfactory, because it provides, without the consumption of extra fuel, a source of steam for heating the fuel oil as well as for heating the ship whenever the main engine is in operation.

If it be considered necessary or desirable to have the anchor windlass available for hoisting at all times, it would be necessary to change the present steam windlass to electric drive. This seems to be unnecessary, however, in view of the fact that the anchor can be dropped and chain veered at any time, with no steam on the windlass. If a sudden emergency required anchoring the ship when in shoal water at sea, steam could be raised in the boiler before raising the anchor again. In this connection it should be noted that by means of a simple circulating arrangement the main engine exhaust may be used to keep the water in the boiler hot all the time at sea so that steam may be raised quickly.

One may now tabulate under two heads the total machinery equipment required. Under the first head will be included machinery that is already in the ship and may be retained. Under the second head will be included all items of new equipment

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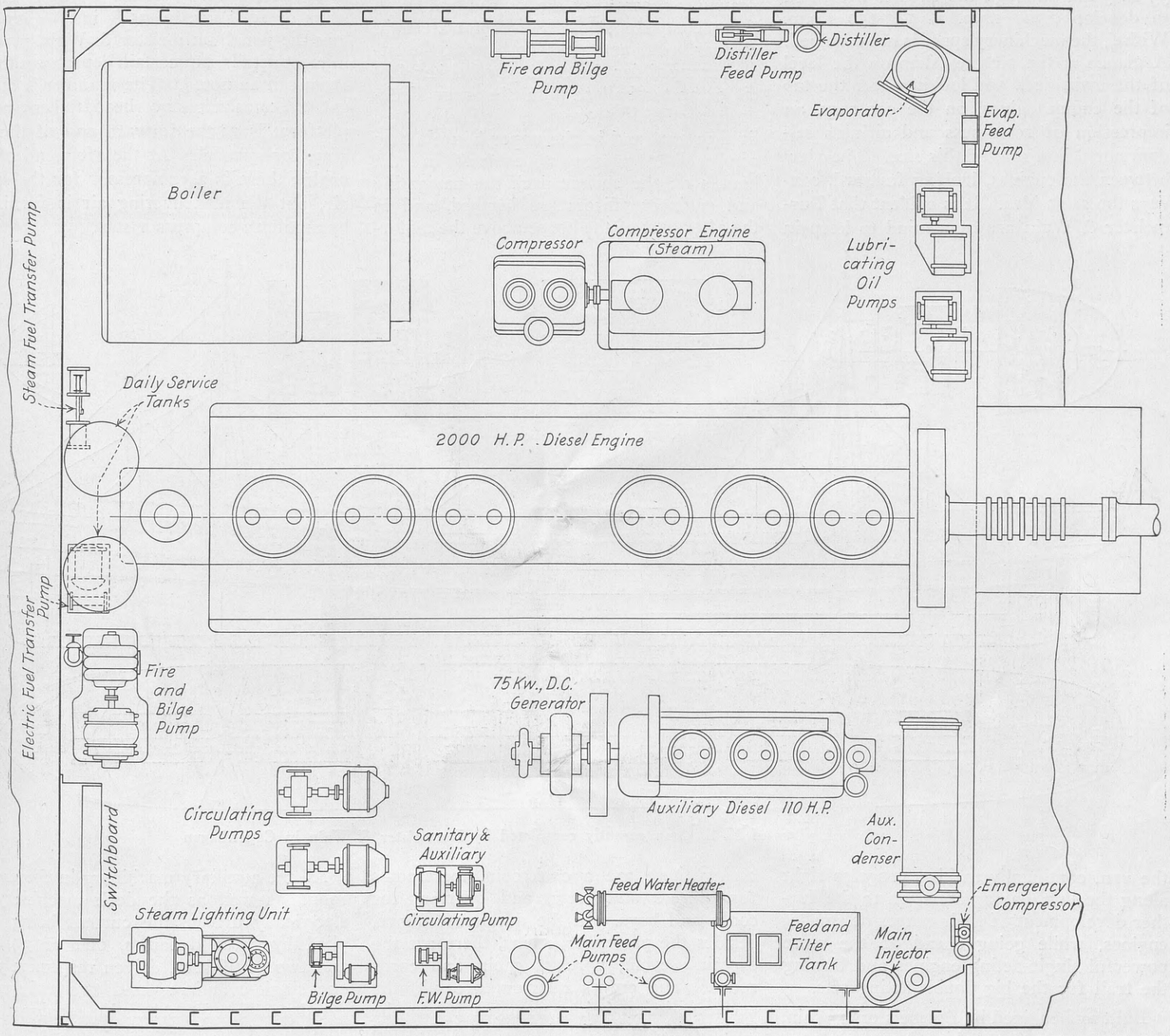



Fig. 2.—Engine room layout in converted Shipping Board steamer, showing retention of some of the steam auxiliaries

# New Type B. & W. Machines in M. S. *Crux*

## *Lighter Design of Machinery for Twin-Screw Motor-Vessels Saves Weight and Space*

IN the M. S. CRUX recently delivered to Det Bergenske Dampskibsselskab, of Bergen, Norway, it is noteworthy that the machinery space and weight are more than usually reduced through the installation of Burmeister & Wain's new light type of engine, developed particularly for twin-screw vessels.

As shown in the accompanying drawings, the total length of the engine room is only 35 ft. 5 in., although the engines are rated to develop 2,300 i.h.p. at 145-150 r.p.m. Withal, the machinery space is not cramped. A glance at the picture taken on the level of the main deck and looking over the top of the engines gives, on the contrary, an impression of roominess and airiness seldom noted in a ship of this size. The view between the engines, looking forward, conveys the same idea. It is evident that Burmeister & Wain are of a mind to keep in the van, continually making progress right along the line, paying attention to the further development of their ranges of smaller engines, while going ahead on the more powerful single-acting engines and blazing the trail for the big double-acting sets.

Built and engined by Burmeister & Wain, the twin-screw motorship CRUX was constructed under Lloyd's special survey to class 100A1, shelter deck, and conforming to the requirements of the Norwegian laws. Her principal particulars are as follows:

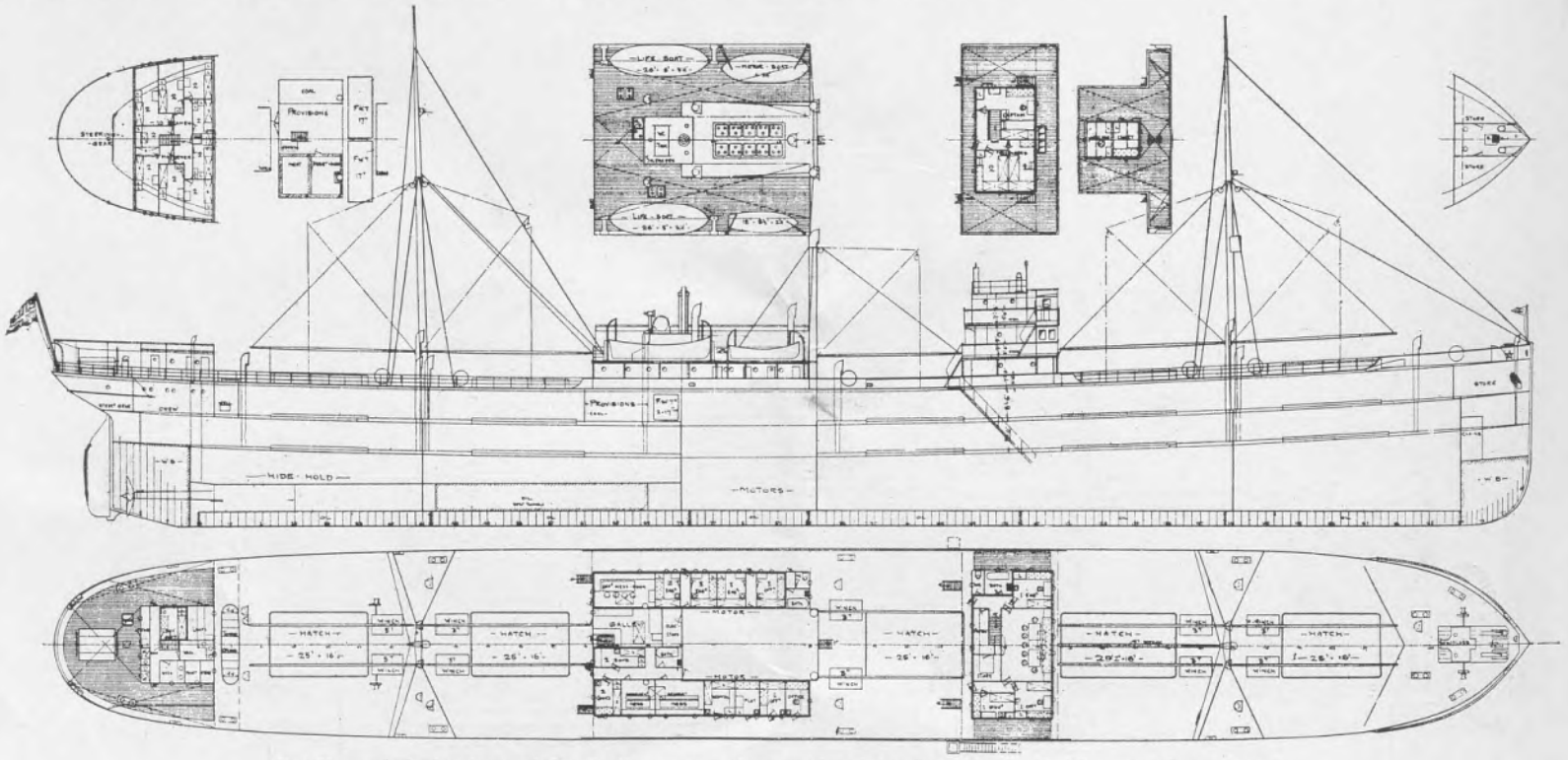
| | |
|---|---|
| Length, overall | 382 ft. 0 ins. |
| Length, between p.p. | 367 ft. 0 ins. |
| Breadth, moulded | 51 ft. 3 ins. |
| Depth, moulded to shelter deck | 34 ft. 0 ins. |
| Depth, moulded to upper deck | 25 ft. 6 ins. |
| Draught, max., loaded | 23 ft. 2½ ins. |
| Displacement, loaded | Abt. 9,700 tons |
| Gross tonnage | 3,828 reg. tons |
| Capacity of holds, grain | 403,000 cub. ft. |
| Capacity of holds, bales | 373,000 cub. ft. |
| Height of double bottom | 3 ft. 10 ins. |
| Water ballast | 1,210 tons |
| Total capacity for fuel | 1,100 tons |
| Horsepower, normal | 2,100 i.h.p. |
| Speed, normal average at sea | 10¾ knots |
| Daily fuel consumption | 6.5 tons |
| Operating radius | 45,000 miles |

A study of the general arrangement drawings shows that the ship is built with three complete steel-decks, six watertight compartments and a double bottom, the latter arranged for the carriage of either fuel oil or water ballast. In the large deckhouse amidship there is a tastefully fitted living room, and in the upper house a few comfortable passenger cabins. In the houses on the shelter deck the navigating and engineer officers are berthed, and in the after part of the house above the motor-casing there are a cookroom, messrooms for officers and crew, and quarters for cooks and boys. In the deckhouse above, besides the passenger cabins, there are the captain's cabin, wireless cabin and cardroom. The crew's quarters are aft, the accommodation being arranged below the shelterdeck in well-lighted and ventilated cabins, each shared by two men. Electric radiators are used for heating.

A fire-extinguishing apparatus of the A. S. Lux $CO_2$ type is fitted with pipe connections to all the cargo holds. This avoids the use of an auxiliary steam boiler.

The vessel carries two masts, and is provided with ten 5-ton derricks, served by eight 3-ton winches, in addition to which there are two 5-ton winches fitted aft that can be used also for warping purposes. All the winches are electrically driven, and the windlass is operated in the same way. The steering gear is of the electric hydraulic type, controlled from the bridge by means of a telemotor.

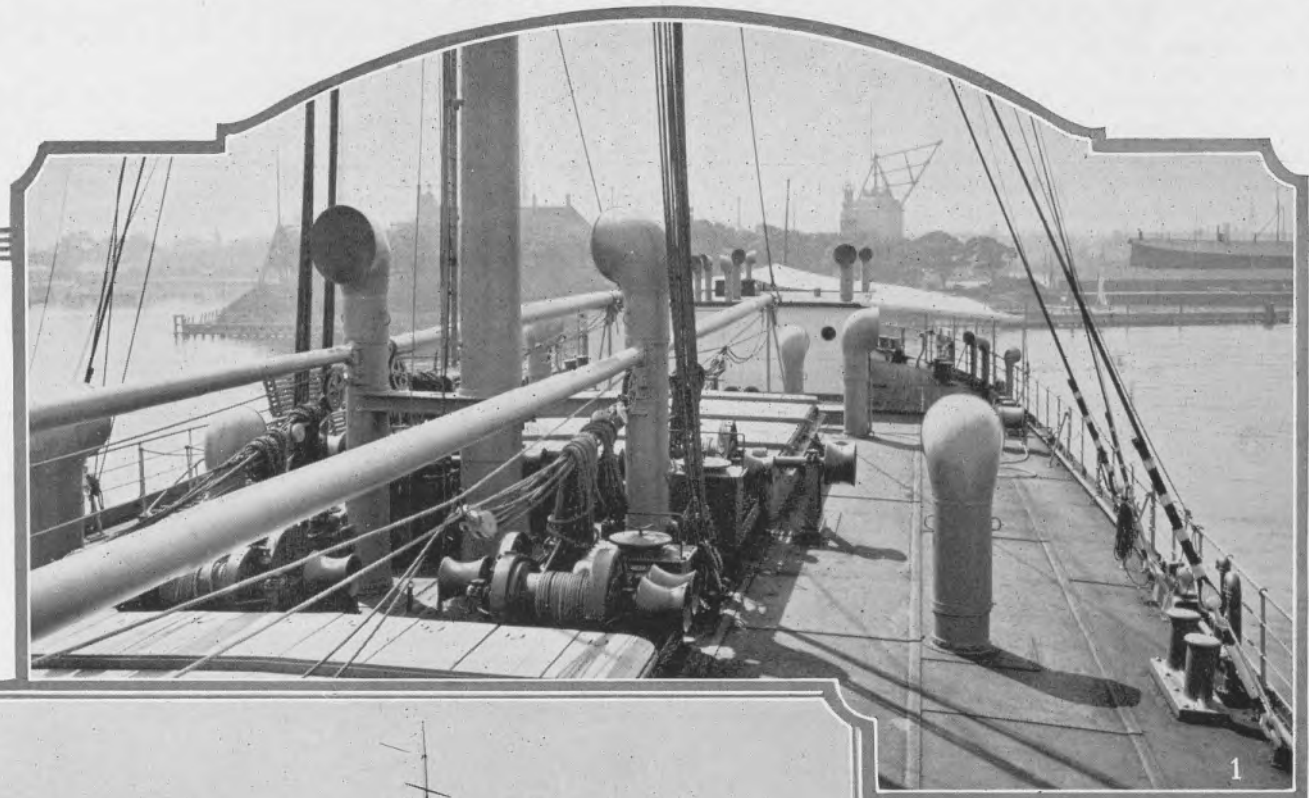
This vessel utilizes only 2,100 i.h.p. for propulsion, although her machinery is designed to develop 2,300 i.h.p. The speed required for the vessel by her owners has enabled this reduction to be made, the screws turning at 130 r.p.m. instead of at 145-150 r.p.m. for which the engines are built. Of the six-cylinder four-cycle type, these motors have cylinder working dimensions of $19\frac{11}{16}$ ins. by $35\frac{7}{16}$ ins. They follow the usual Burmeister & Wain practice in most details, but certain departures therefrom can be noted. The framing is different, the camshaft is overhead, the engineer's platform is at the forward end of the engine, for instance. At the after end of the engine there is a compressor for the spray air, but the maneuvering air is furnished by auxiliary compressor sets.




**Profile and deck plans of M. S. *Crux*, recently completed by Burmeister & Wain in Copenhagen**

All the auxiliary machinery in the engine room, as well as the deck machinery, is electrically driven, the current being supplied by three dynamos, one of 35 k.w. and two of 66 k.w., driven respectively by one single-cylindered and two twin-cylindered auxiliary Diesel engines designed and constructed by Burmeister & Wain. The voltage for power purposes is 220 volts, but for lighting and heating purposes this is stepped down to 110 volts by means of a motor generator. Any one of the dynamos is sufficient to supply the necessary current required for normal working at sea, but, two, or even all three, have to be in operation when the vessel is maneuvering in and out of harbor with the maneuvering compressor working, or when loading and discharging cargo. This presents advantages from the point of view of economy.

It is interesting to look over the machinery weights, which are as follow: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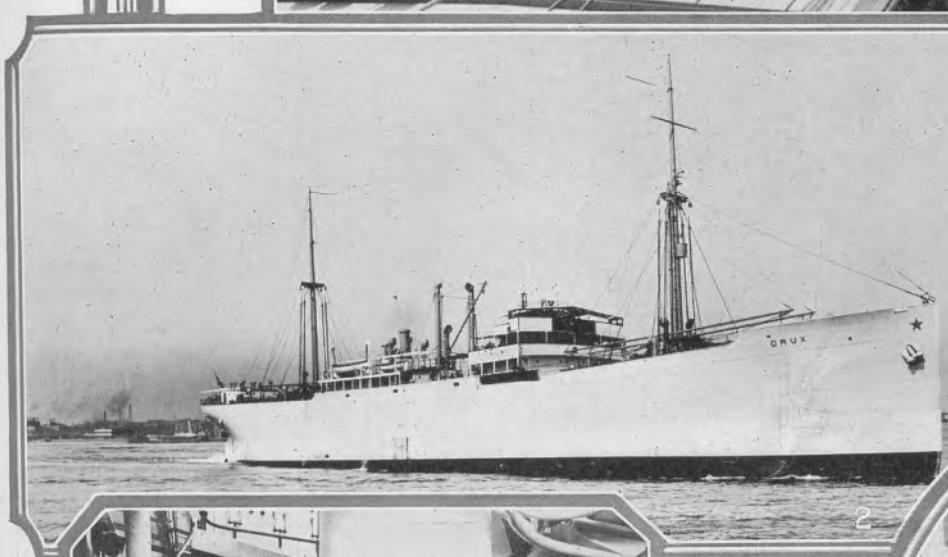

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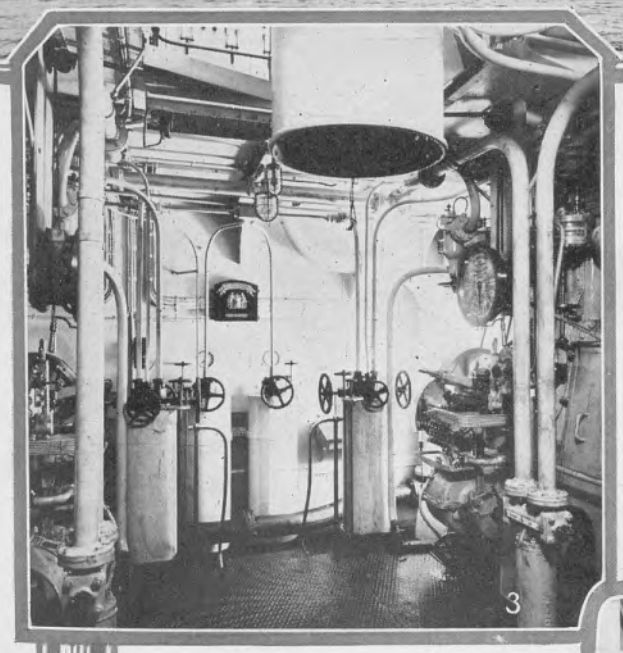
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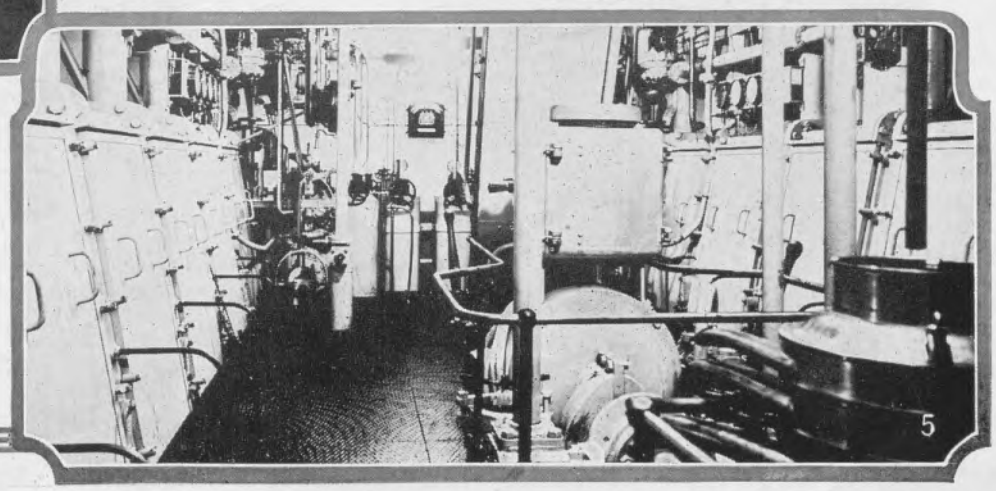
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M. S. *Crux*. 1.—View of electrically operated winches serving the after hatches. 2.—The vessel on trial. 3.—Location of the engineer's platform at forward end of engines. 4.—Circulating fan supplying heated air to the living quarters. 5.—View between the engines, looking forward

| | | |
|---|---|---|
| Main engines | 162 | tons |
| Auxiliary engines | 35 | " |
| Auxiliary machinery | 8.5 | " |
| Tanks and flasks | 20 | " |
| Shafting, complete with all accessories, including spare propeller | 41 | " |
| Ladders, grating, floor plates, lifting gear, spare parts, engine room ventilators, telegraph gears, special tools, etc | 20 | " |
| All piping clear of engine and including bilge and ballast piping, bottom valves, etc | 18 | " |
| All electrical material inside engine room | 3.5 | " |
| Water in piping | 4 | " |
| Total | 312 | tons |

On the trial trip of this ship in the Sound at Copenhagen, a mean speed of 10.94 knots was obtained with a fuel consumption of 0.284 lb. per indicated horse-power, the net heat value of the fuel used being 18,100 b.t.u. per pound. This fuel consumption includes the consumption of the auxiliary engines producing the necessary current for driving the auxiliary machinery, the steering gear and the electric light.

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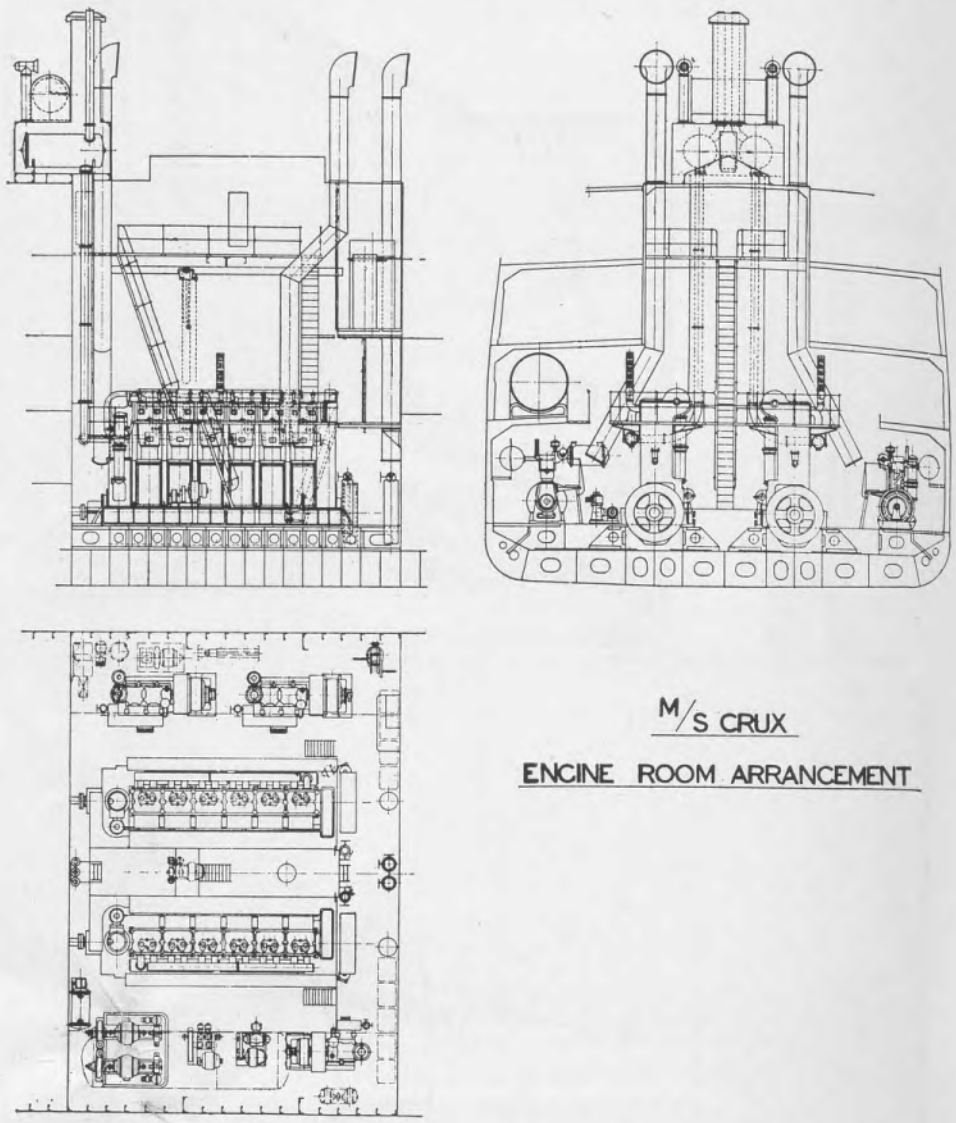
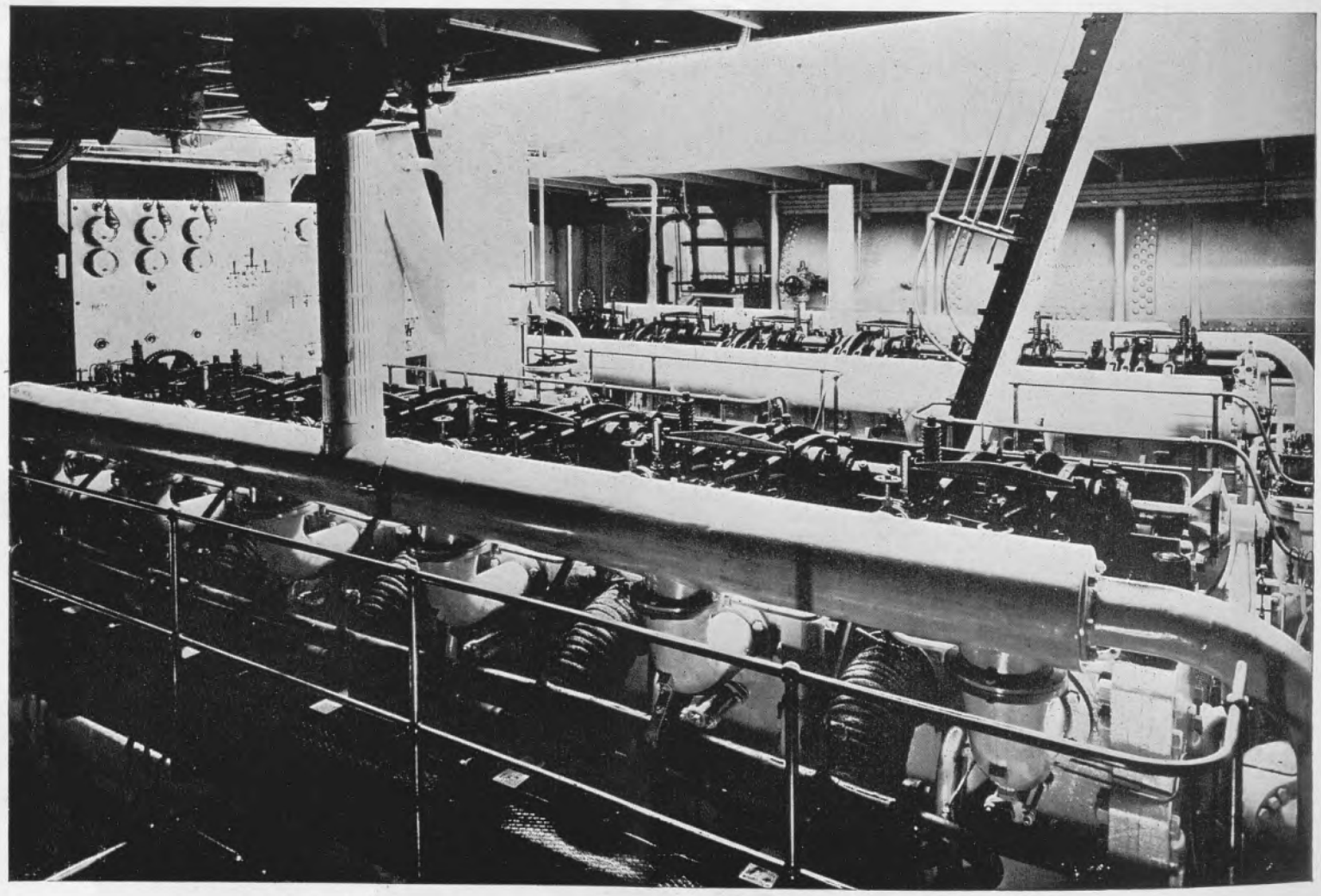
That the change brought about by the marine oil engine might entirely falsify any recommendations made at the present relative to a fast steamer service between the United Kingdom and Australia, was one of the statements made in the report of the Imperial Shipping Committee, which at the instance of the Commonwealth Government of Australia, made an investigation into the Australian trade.



This view, looking across the top of the machinery space in the M. S. *Crux*, shows the roominess available

# Features of the 12,000 H.P. M.A.N. Engine

## *Big Double-Acting Marine Set, Built at Nuremburg, Tried Out Under Severe Conditions*

A GOOD example of the fact that news does not always deal with facts of recent occurrence, is afforded by the interest attaching to the accompanying illustrations and test data of the 12,000 h.p. double-acting Diesel engine built at the Nuremburg works of the M. A. N. during the war.

The official tests were completed in 1917, and about two years later the engine was destroyed by order of one of the Allied Commissions entrusted with the task of carrying out the provisions of the terms of the Armistice that dealt with military and naval equipment. It is true that this engine was designed and built to the order of the German Navy for the purpose of installation in a capital ship, which, we understand, was to have been the battleship SACHSEN.

This, however, scarcely warranted the junking of the engine, and its destruction is only excusable on the grounds that the Allies felt immediately after the Armistice that everything in Germany associated directly or indirectly with military or naval material should be immediately scrapped. At a later date, it will be remembered, the Germans were allowed to convert some of the submarine type engines for commercial purposes, examples of which have been seen in the motorships HAVELLAND, MUNSTERLAND and RHEINLAND, of the Hamburg-American Line, which are running regularly into American ports.

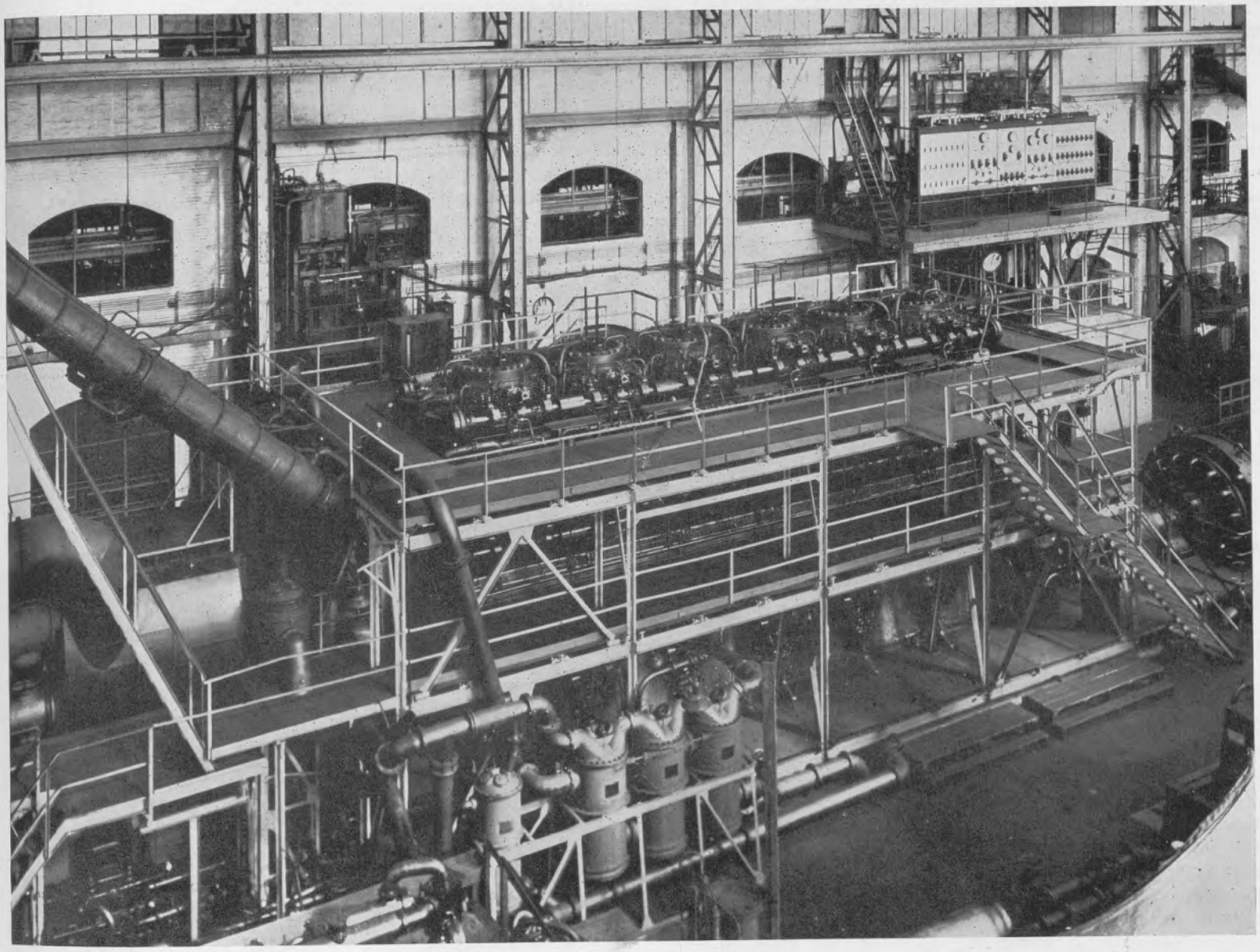
A tremendous sum of money was spent on the development of this engine. Work proceeded steadily on the design and construction from 1910, when the order was placed by the German Navy. An engine of similar power was ordered also from Krupp's at Kiel, who are reported to have wrecked their engine themselves in order to prevent it being examined and inspected by any of the Allied Commissions. Both engines were of the six-cylinder double-acting two-cycle type, rated nominally at 12,000 h.p.

This article will deal only with the Nuremburg engine, details of which were given out for the first time at the meeting of the Verein Deutscher Ingenieure in Berlin this summer, in a paper read by Dr. Nägel.

Through the courtesy of Dr. E. Foerster, Consulting Engineer of the Hamburg-American Line and editor of the German shipping magazine, *Werft-Reederei & Hafen,* we are enabled to publish in this issue a picture of the big engine on the test-bed in the Nuremburg shops, this being the first illustration of its kind that the M. A. N. has allowed to be published.

With a cylinder diameter of 33½-in. and a piston stroke of 41⅜-in., the engine was designed to develop 12,000 b.h.p. at 160 r.p.m. It is interesting to recall that at the time the designs for this engine were first taken in hand the biggest Diesel engine which had been built gave about 1,000 b.h.p., and the boldness of the M. A. N. engineers in facing the problem of developing 2,000 b.h.p. per crank is thereby made very apparent.

A number of changes were made in the design, and several styles of cylinder construction were tried out before the complete engine was finally put under test at the beginning of 1917. Between January 4th and April 5th of that year the engine made



Double-acting engine of 12,000 rated h.p., erected in one of the big shops at Nuremburg for the tests described in this article

over 2,000,000 revolutions. The final test was particularly interesting. An uninterrupted trial of five days and five nights was made with the engine developing between 10,800 and 12,000 shaft h.p. Loaded up to the fullest capacity of the brake, the engine developed 17,150 shaft h.p., which represented an overload of 43 per cent.

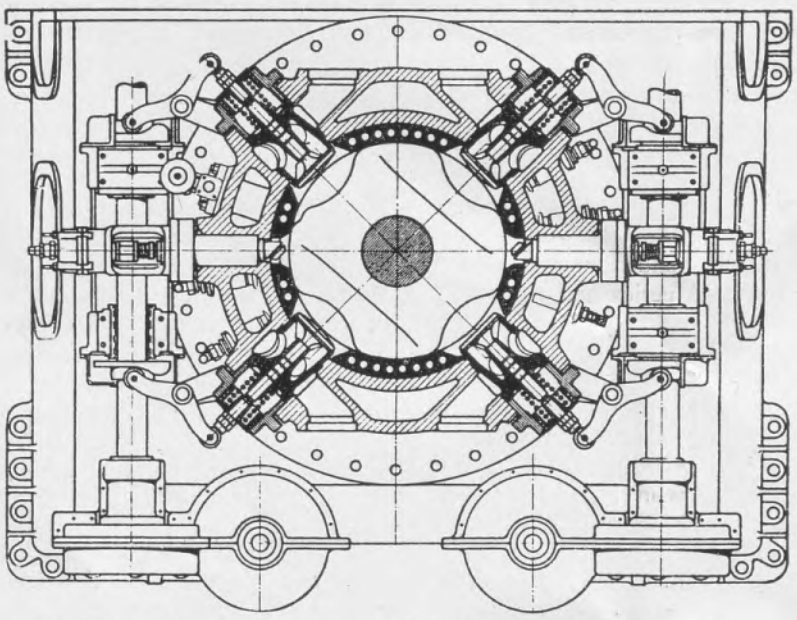
An even higher power per cylinder was obtained on a test with a single crank on October 16 of the same year, when, with a mean indicated pressure of about 150 lb. per sq. in., a load of 3,573 indicated h.p. was measured at 145 r.p.m The mechanical efficiency of this single cylinder machine was found on test to be 90 per cent. The maximum brake h.p. developed per cylinder was therefore in excess of 3,220 h.p.

In a diagram, published herewith, the curves of fuel consumption, spray-air pressure, scavenge-air pressure and scavenge-air temperature are shown, as obtained on the tests with the single cylinder engine. It is not clear whether the ignition oil should be added to the main fuel oil, or whether it is included therein. Inasmuch as ignition oil is used in Germany only when tar oil is being burnt, one is led to infer that the two consumption curves should be combined, note, however, being taken of the low heat value of tar oil, which is only about 16,000 b.t.u. per lb.

Some interesting measurements were made of temperature differences at points on the inner and outer surfaces of the cylinder liners. For instance, when the engine was opertaing with a mean pressure of about 95 lbs. per sq. in. in the cylinder, there was a difference of 320 degrees Fahrenheit between the inner and outer walls of the liner, at the hottest part of the cylinder. This can be compared with a temperature difference of 185 degrees Fahrenheit maximum which was found by Alt, chief engineer of the Krupp works, in some tests he carried out on a four-cycle submarine type engine. This contrast furnishes a measure of the difficulties that have to be overcome in the construction of high-powered two-cycle double-acting engines.

Originally designed with scavenge valves in the cylinder covers, the engine was later altered to the style shown in the cylinder sections on this page. It was found that the cylinder heads cracked very quickly when the scavenge valves and injection valves were contained in them. It was also discovered very early in the development of the engine that a single-piece cylinder liner exhibited such a strong predilection for cracking upwards and downwards from the exhaust ports that such a design could not be utilized.

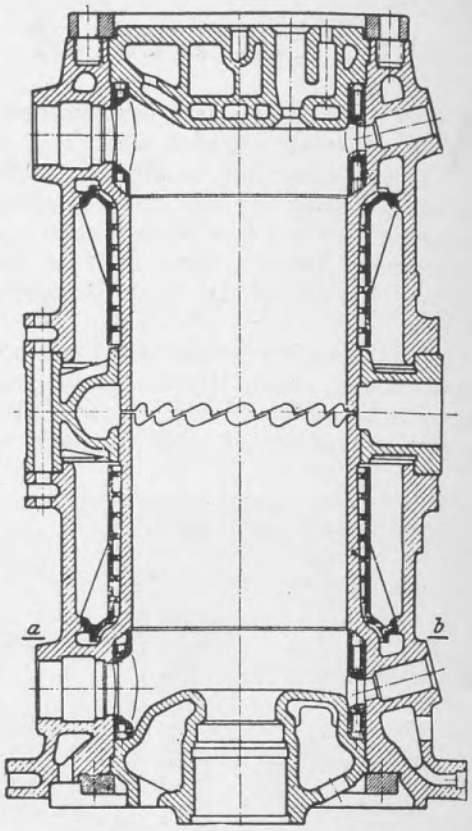
Experiments with various designs of cylinders and cylinder covers lasted several years, and it was not until all the major difficulties had been overcome, that the six-cylinder set was actually built, although, as will be related further, a three-cylinder set was erected in 1911. As finally designed, the cylinder comprised an upper and lower section, which were united at the exhaust belt. Where these liners met in the middle of the cylinder, they were cut saw-tooth fashion, providing both for exhaust ports and for expansion.



Horizontal section through cylinder of M.A.N. double-acting engine

Each of these sections was composed of a half-liner with its corresponding jacket. When the two sections were bolted at the middle, they were free to expand or con tract upward or downward, as the cylinder conditions varied. At the combustion end of each half-liner there were six valve chambers, four of which housed the scavenge air valves, and two of which contained the diametrically opposed injection valves, which sprayed the fuel into the combustion space in a tangential direction.

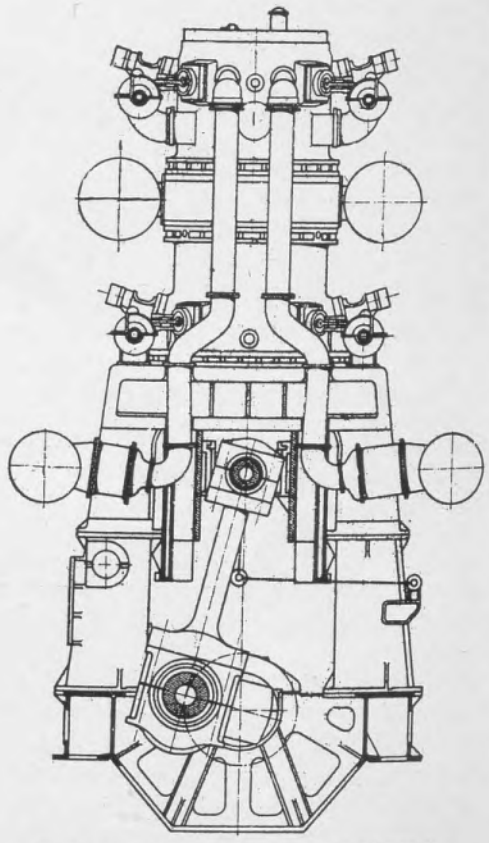
To overcome the tendency that manifested itself for cracks to develop in the region of the valve chambers, the M. A. N. engineers ultimately devised a successful method of keeping the intense heat away from those parts of the casting by means of protecting shields of steel. These were of annular form, perforated with passages connected into the water circuit, and thus maintained at a relatively cool temperature. At their thinnest section these steel rings had only about 11/16ths of an inch of metal. They were difficult pieces to machine, and




Vertical section through cylinder of M.A.N. double-acting engine

were not easily fitted, but, in view of the excellent results they gave, their use was decidedly satisfactory.

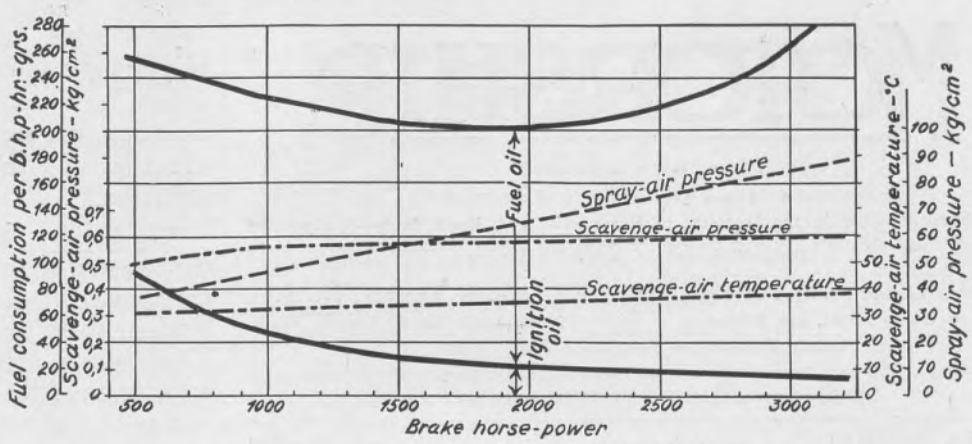
To assist in transferring the heat from the cylinder liners to the jacket water recourse was had to a barrel closely surrounding the liner, but not touching it at any point, and in which a spiral passage was formed through which the cooling water was driven at high velocity. This barrel was supported by the outer wall of the jacket. The data given earlier in this article regarding the temperature difference between the inner and outer surfaces of the



End view and part section of 12,000 h.p. M.A.N. engine

liner, helps one to understand why special means were taken to increase the rate of transfer of heat from the cylinder to the cooling medium.

In the design of cylinder covers to which the trials ultimately led, a relatively simple form of casting obtained. In the upper cover there were only a starting valve and a relief valve; in the lower cover there were just the stuffing box and a relief valve. Both at top and bottom the cylinder covers were retained by heavy steel rings bolted to the cylinder castings. No bolts actually passed through the cover castings. This relieved them of some of the strains to which they would otherwise have been subjected.




Performance curves of 12,000 h.p. M.A.N. engine

Reference was made at the meeting of the German engineering society in Berlin, where this engine was first publicly described, to the fact that in 1912 an unfortunate scavenge-air explosion took place in connection with the development of this engine. Serious injuries were caused to those who were on the engine staging at the time. The relation of the explosion itself to the accident was about the same as the relation of the earthquake to the San Francisco disaster. In both cases fire was the direct cause of the losses. So many vague and inaccurate references have been made to this accident from time to time that it seems well to recall here the actual facts in the case.

The engine under test at the time was a three-cylinder set, the bearings of which showed a tendency towards overheating. The German Navy engineers who had charge of the test met the trouble by using a liquid that was employed on the German destroyers for cooling hot bearings. This liquid contained at least one very inflammable element. The vapor rising from the overheated bearings entered the engine through the scavenge-air system, and it was while the scavenge-air manifold and the chambers contained such a mixture that one of the scavenge valves broke and permitted a flame to escape from the combustion space. This set fire to the inflammable mixture in the scavenge-air system and exploded. The flames lighted the oil-soaked wooden staging and canvas screen around the engine, and some of the men were trapped by the fire. That was the explanation given by a naval inquiry in Germany. As will be seen from the picture of the engine, all the staging used thereafter was of a non-inflammable character.

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Six coastwise vessels, each to be equipped with two Sulzer type engines of 600 h.p., have been ordered by a tobacco company in Spain from the yard of the Compañia Euskalduna at Bilbao.

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Fire broke out in No. 2 hold of the motorship TONKING of the East Asiatic Line on her last outward bound voyage from Copenhagen to Californian ports with a large cargo. On arrival at Colon she reported that she had been able to extinguish the fire without assistance.

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CAROLINE, an 820-tons d.w. motorship, powered with twin 120 b.h.p Hera oil-engines, recently ran trials. She was built by the H. C. Christensen shipyard, at Marstal, Denmark. Her overall length is 192 ft., length b.p. 175 ft., breadth 32 ft. and depth 14 ft. She has a speed of 8¼ knots.

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Wilhelm Wilhelmsen is rapidly assuming a leading place amongst the motorship owners of the world. This enterprising shipowner of Christiana and Tönsberg, Norway, will have a fleet of motorships of about 150,000 tons deadweight when his present motorship program is completed in about two years time. The motorship TAMPA, 6,400 tons deadweight capacity, was launched for this owner by the Deutsche Werft in Hamburg about the middle of July. A sister ship, TAMPICO, will be ready for launching about the end of August. Both these vessels, which will have a speed, loaded, of about 13 knots, are to be operated between Norway and Gulf Ports. All the motorships of this firm have Burmeister and Wain engines.

The TITANIA, one of the motorships owned by W. Wilhemsen of Norway, recently concluded its maiden voyage to the east coast of South America and back.

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An order for three motorships of about 10,000 tons each has been secured by the Odense Shipbuilding Company, in Denmark, which is controlled by A. P. Moller, the well-known Copenhagen shipowner. The Diesel machinery will be supplied by Burmeister & Wain and the electrically operated deck gear will be furnished by T. B. Thrige. The name of the owner has not been disclosed, but it is stated that the boats are not for Danish account.

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Pacific Coast ports are attracting a large proportion of the biggest and fastest motorships. Many of the East Asiatic motor liners make regular calls there. Furness Withy & Co., Ltd., are putting their best motorships on the route between Europe and these ports. The Holland-American Line and Royal Mail S. P. Co. are using motorships on the same service. Danish and Swedish motor vessels are frequently seen in the Pacific Coast ports. It is now stated, unofficially, that two big vessels of about 22,000 tons displacement, which the Royal Mail Steam Packet Company has ordered from Harland & Wolff will call at Los Angeles and ports north, although they were understood to be for the South American trade. Announcement has been made that the Nippon Yusen Kaisha motor vessels will be placed on the Pacific run, and the 17-knot passenger liner of the Union Steamship Co. of New Zealand, is expected to touch at Vancouver, B. C.

The Götaverken launched on August 14 the Motorship OXELOESUND of 8,350 tons d.w., for the Grängesberg Ore Co., of Stockholm, Sweden. This is the fifth motor vessel built in Gothenburg for the same owners. She is 397 ft. long, 53 ft. 3¾ in. extreme breadth, and 25 ft. 3 in. moulded depth. Her main propelling machinery will be two Göta engines of the Burmeister and Wain type, rated at 2,150 h.p.

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During the last week of July, four large motorships passed west through the Panama Canal. They were the ARATOR of the Svenska Lantmannens Rederi, bound from Christiania to Portland with cement and general cargo; the TONGKING of the East Asiatic Line, from Copenhagen for Vancouver with rails, rags and general cargo; the SPREEWALD of the Hamburg-American Line, bound for Cristobal with general cargo; and the BUENOS AIRES of the Swedish Johnson Line, carrying cement, paper, pulp and general cargo from Gothenburg to San Francisco.

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In addition to the FALERIA, building for the Societá di Navigazione Roma, the Spezia yard is building a motor tanker which will be named LANURIA.. Her carrying capacity will be about 8,000 tons d.w., and the dimensions approximately the same as those of the FALERIA. The engines installed will be of a similar type built by the San Giorgio firm and each developing 1,100 b.h.p. at 110 r.p.m. In this vessel all the auxiliary machinery, including the cargo pumps, as well as the engine room auxiliaries, will be steam driven, two oil-fired boilers being installed for this purpose.

# MOTORSHIP

Trade Mark, Registered





Published Monthly in the Interests of Commercial and Naval Motor Vessels and for Recording International Progress of the Marine Heavy-oil Internal-Combustion Engine

**Head Office: 27 PEARL STREET, NEW YORK, N. Y.**

417 Montgomery Street, San Francisco 71 Columbia Street, Seattle, Wash.

Cable Address—Freemote New York.

Published by MILLER FREEMAN & COMPANY

MILLER FREEMAN .....President
THOS. ORCHARD LISLE.....Editor
A.M.S. Naval Engineers. A.M.I. Marine Engineers.
R. W. CROWLY .....Consulting Editor
RUSSELL PALMER .....Manager

Subscriptions rates: U.S.A. and Mexico, $3.00 per year; Canada and foreign countries in the postal union, $3.50. Single copies: United States, 25c.; Great Britain, 1/6. Other countries, 35c.

"Motorship" is published on the 20th of the month prior to date of issue, and all changes in and new copies for advertising must be in the hands of the publisher prior to the 5th of each month. Notice of discontinuance of advertising must be given before the 1st of the month, preceding issuance.


## A Good Example in Management

A LOT of shipowners are looking for the key to success in their line of business. It is generally understood that the key bears the identifying mark "brains and experience." Furness, Withy & Co., Ltd., are one of the big concerns generally recognized as being in possession of a pass key. At the recent annual general meeting of this company held in London there was some evidence of this. The Chairman, Sir Frederick W. Lewis, in the course of his speech to the stockholders, made the following pregnant remarks:

> "In the midst of a severe trade depression, a depression which is affecting almost every industry—certainly every export industry, with perhaps the one exception of coal—and with the future outlook so uncertain on account of the political and economical conditions, to which I have already referred, it is a most difficult matter for the directors of a commercial undertaking to face new development work. All the same, it is one of the first principles of business to keep abreast of the times, and although trade is practically at a standstill, except for bare necessities, conditions are constantly changing, and moreover, as prudent managers we are bound to maintain our fleet in a state of the highest efficiency in order to take advantage of any trade improvement that comes along; or alternatively, by economical working to be able to earn profits where less efficient vessels would be unable to do so. . . .
>
> "In these days of continual invention, shipowners, no less than other industrialists, cannot afford to ignore progressive development. We have, therefore, for some time been carefully investigating the possibilities of the internal combustion engine. There is, no doubt, a certain amount of development work still to be done before this type of marine engine is perfected, and the extra cost of production militates against any extensive programme until these costs are reduced. Still, as a result of our experiences, we have felt justified in contracting for these vessels."

When a company has such a broadminded and progressive management as these statements bear witness to, one can be pretty sure that it is successful in business. No wonder that such a concern, after taking proper care of the depreciation account, could carry forward last year an amount equal to over 5% of its common stock. Stockholders received a dividend of 5% paid out of earnings, and a bonus of 2½% paid out of surplus. The Furness, Withy Company is rapidly becoming one of the biggest motorship owners of the world.

## Survival of the Fittest

TODAY the world's gross tonnage exceeds that of 1914 by more than 15,000,000 tons, an increase, as everyone knows, out of proportion with the world's trade. The idle tonnage is relatively unimportant, and nearly every shipowner is fighting for a share of the trade, with the consequence that freight rates are down almost to the level of 1914, notwithstanding that operating costs are away above those of the same year.

Statistics show that the world is giving employment today to about 3,000,000 tons more shipping than at this time last year. This figure, which represents the decline in idle shipping plus the new tonnage completed, and minus the year's losses, is construed as evidence of an improved shipping situation, but we do not share that view. Increased earnings are the only measure we know of an improved shipping situation.

We believe the more extended employment of tonnage at the present time is due more to an increase in the length of voyages than to an increase in the volume of goods moved. Freight rates are no better now than they were a year ago. The reports of the shipping companies preclude the acceptance of the idea that the situation has improved during the last twelve months.

Yet in glancing around the world, one finds companies that are making money and paying dividends out of earnings, which is quite different from paying dividends out of reserves. Which are these companies? We find they are the concerns owning motorships.

This is a very striking fact. It confirms the consistent editorial policy of this magazine. It goes to show that our constantly reiterated statement that motorships would make profits when steamers were making losses is being proved true. Apparently this conclusion has forced itself upon the minds of many foreign shipowners, including the British, notoriously conservative though they be.

An examination of Lloyd's Shipbuilding Returns, analyzed on another page of this issue, discloses incontrovertible evidence that there has been a constantly maintained increase in motorship construction while steamship building has fluctuated violently, and mostly downward. The last report from Lloyd's, covering the three months ended June 30th of this year, reveals that motorship tonnage commenced during that period, was half as much as the steamer tonnage. If this rate of increase is maintained there will be more motorships than steamers ordered next year.

This trend of shipping activity should not be ignored by those who are bending their efforts to the maintenance of the American Merchant Marine. Obviously, if the most enlightened shipowners of other countries are substituting motorvessels for steamers because they find the net earnings of the newer type of vessel are greater than those of the older type, we cannot expect American steamships to hold their own on the Oceans.

Owners engaged in American coastwise trade may be foregoing profits by adhering to steamers, but they are not running any risk of being driven out of business in that protected zone of shipping. The men and companies who have money in foreign-going tonnage under the American flag, are, however, courting failure by stubbornly refusing to derive profit from the advantages and merits of the motorship. The biggest owner of them all is Uncle Sam, and his ships (which, after all, are yours and ours) are going to be hardest hit by the fight for supremacy between the motorship and the steamer.

The fate of our Merchant Marine will depend finally upon its competitive efficiency. How little of our ocean-going tonnage is qualified at the present time to win out in the long run? How much of it will stand the test when other nations are even further ahead of us with their motorships?

Our more enlightened shipowners see what is ahead, and have been placing orders for motorvessels. They have recognized that the world is not standing still for the benefit of those who want to stand still; they see that the world is always going ahead. Classing themselves among the fittest, they will survive—they are the ones Providence will help because they help themselves — but what of the Shipping Board and all the others?

# E. F. Hutton's New Diesel Auxiliary Yacht

***Hussar IV*, a Three-Masted Single-Screw Schooner with a 600-H.P. Engine, Now in Commission**

AFTER a fast ocean passage and a brief visit to a Brooklyn dry dock, the new schooner yacht, built and engined by Burmeister & Wain on the other side, was delivered to E. F. Hutton in good time for the best of the yachting season. The arrival of the boat at New London, Conn., was reported in our last issue.

When Mr. Hutton entrusted the order to the famous Copenhagen firm of shipbuilders and engineers, he was not starting them in a new line. They are an old firm, with a history and quite a varied experience, which has included *inter alia* the construction and equipment of the late unfortunate Czar's palatial yacht, the STANDART. They have also a staff of cabinet makers who are wonderful craftsmen and produce beautiful furniture. Not alone in motorship building do Burmeister & Wain excel—it is a versatile as well as able firm.

This new schooner is one of the largest auxiliary vessels in the fleet of the N. Y. Y. C., her dimensions being:

| | |
|---|---|
| Length over all | 204 ft. 6 ins. |
| Beam | 33 ft. 0 ins. |
| Draft | 14 ft. 6 ins. |

She is equipped with a 600 h.p. Burmeister & Wain Diesel engine, placed well forward of amidships and driving a two-bladed feathering bronze propeller which, when folded into its recess, forms practically no obstruction to the speed of the yacht, but when in use can drive the HUSSAR continuously at a speed in excess of eleven knots.

This new ship is as perfect and complete as any vessel ever built, Mr. Hutton having spared no expense, and every detail having been given the most careful attention. The designers in preparing the plans for the HUSSAR had in mind the instructions of the owner that, while he wished as fine a craft as could be built from his point of view, giving him the maximum of comfort and room, he was extremely anxious to have a vessel that would be very able, would handle well under sail and under power, would not be unduly expensive to construct or operate, and would provide excellent quarters for the officers and crew. An inspection of the new yacht demonstrates that these various requirements have been successfully carried out by Messrs. Cox & Stevens, who designed her and supervised her construction.

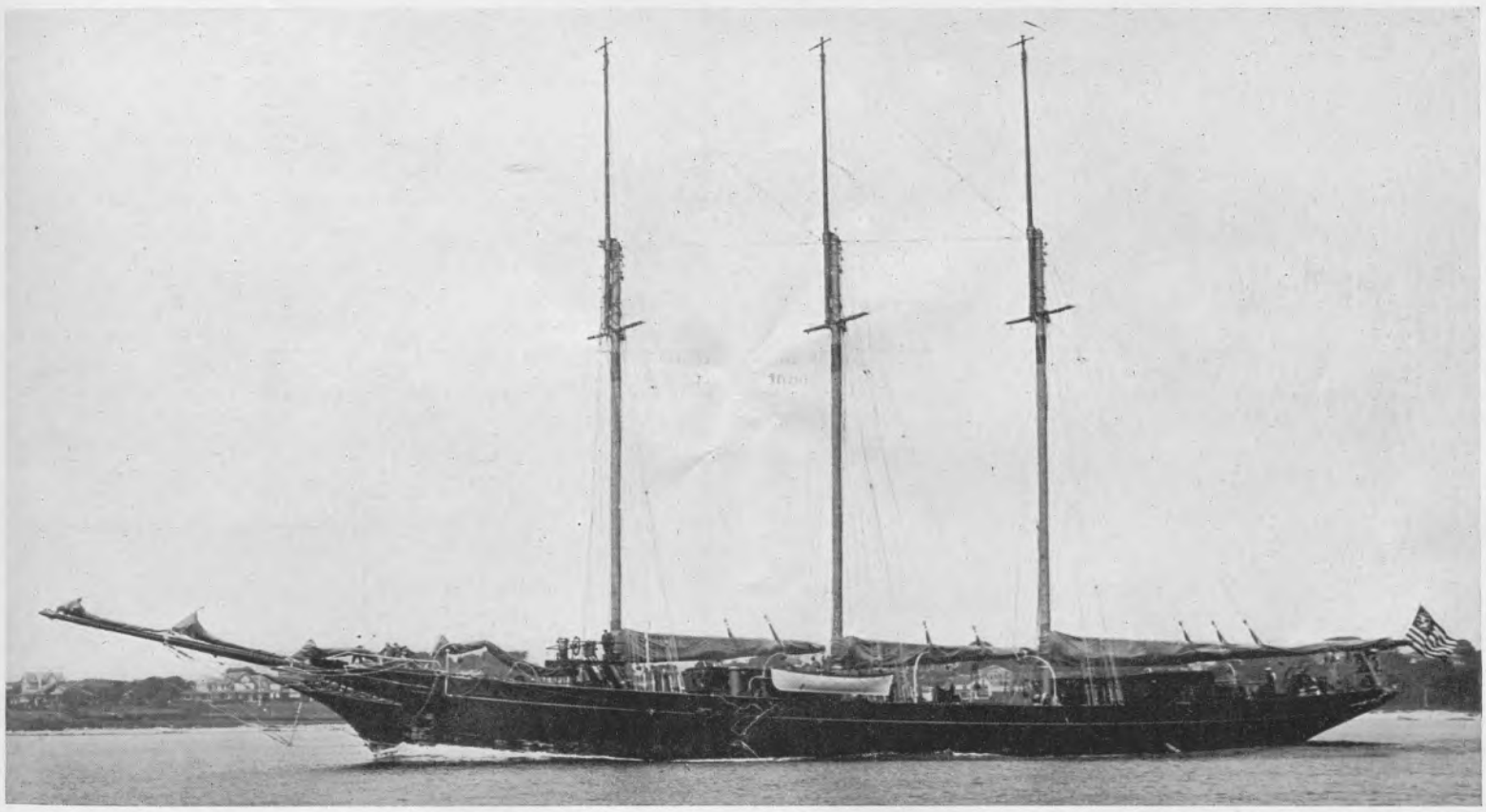
Arrangements were made to have the well known firm of interior decorators, Wm. Baumgarten & Co., Inc., co-operate with the designers as far as the finish of the quarters for the owner and his guests was concerned, and also in the matter of furniture and furnishings. This arrangement worked out to the satisfaction of all concerned, and the HUSSAR has been pronounced by those who have had an opportunity of inspecting her since she arrived as one of the most beautifully furnished and completely equipped vessels in the fleet.

Having in mind the requirements of the owner and his intention to use the yacht on extended cruises, the designers decided upon a flush deck vessel, with clipper bow and moderate overhang aft, and with a raised poop to provide a dry space on deck for the owner and his guests when at sea in heavy weather. The proportions of the hull were selected with a view not only to comfort and seaworthiness, but also having in mind the serious disadvantages of excessive draft. With the very moderate draft of 14 ft. 6 in., HUSSAR, while having an excellent form for driving under sail as well as power, is able to enter any of the harbors which Mr. Hutton expects to visit.

The vessel was built according to Lloyd's highest classification for yachts, and all the scantlings and details of construction are in accordance with Lloyd's rules for a rugged and substantial craft. The vessel is a three-masted schooner, having only a moderate sail plan, but carrying sufficient canvas not to be sluggish when under sail. A rather unusual sparring arrangement was determined upon in order to reduce the size of the individual sails, the foremast being stepped further aft than usual and four lower headsails being carried, an arrangement that has worked out extremely well. The topmasts of this vessel are of such a height that she can pass under Brooklyn Bridge without sending them down, which is an advantage in the case of a vessel to be used, as this one will be, so largely in and around New York waters.

For the weather deck heavy teak planking has been used, and the deckhouses, of which there are two, are also of teak, as are rails, skylights, and all other fittings of like character.

Starting at the break of the poop, the after deckhouse forms a comfortable living room



*Hussar IV*, auxiliary schooner yacht, owned by E. F. Hutton; built and engined by Burmeister & Wain, Copenhagen

and affords access to the owner's and guests' quarters on the lower deck, there being in addition a companionway to the poop deck. The forward deckhouse, located just forward of the mainmast, contains the quarters for the wireless operator as well as the wireless apparatus, and in addition a large and well equipped chart room. This deckhouse has also been skilfully used to provide companionways for the officers and crew.

An unusual feature of this new craft is the navigating bridge placed just forward of the foremast and from which the Captain has at all times an opportunity for navigating the ship without intruding in any way on the owner and his guests. It is so placed and so constructed as in no way to be unsightly or to interfere with the proper handling of the vessel under sail.

The arrangement below decks is rather novel. The companionway from the after deckhouse runs athwartships and lands just aft of the mizzenmast on the center line of the vessel, there being a fore and aft passageway slightly on the starboard side of the centerline. At the forward end of this passageway, the dining room has been placed, a large, well proportioned room, about 16 ft by 21 ft. 6 in., and having the proper headroom to work in with these dimensions. This dining room was not worked the full width of the ship because that would have produced a badly proportioned space. Instead, on the starboard side there has been arranged a pantry, providing convenient service for the stewards' department and communicating also with the crew's quarters. The dining room is a most attractive apartment, beautifully furnished, and with a large fireplace which adds greatly to the effect.

At the after end of the fore and aft passageway mentioned, and under the poop deck, are the private quarters for Mr. and Mrs. Hutton. These consist of two very large staterooms and two separate bathrooms, as well as large wardrobes and lockers, and exceedingly comfortable and attractive furnishings. These rooms not only have light and ventilation through the air ports and overhead skylights, but in addition have ventilating ports at the forward end where the deck level changes to the raised poop, which will provide excellent ventilation under all conditions.

On the port side of the passageway are two very large double guests' rooms, approximately 11 ft. by 15 ft. in size, and two well equipped bathrooms. On the starboard side are two other similar guests' staterooms, only slightly smaller, each having separate bathroom, and, in addition to the owner's quarters there is a maid's room. Each of the staterooms and bathrooms in this part of the ship is well ventilated, not only by air ports but by overhead skylights.

Accommodations for the officers and crew have been laid out with great care and there has been no attempt to crowd this part of the vessel, the owner having realized that in order to have a successful ship he must make it possible for his officers and crew to be comfortably housed.

The forecastle proper, which is at the forward end of the berth deck, is fitted in a conventional way with pipe berths, of which there are twelve, these being in three tiers, each man having a separate locker and there being a well equipped toilet room in the forepeak. Access to the forecastle is through a companionway on deck, just aft of the capstan, but this space may also be reached from the after part of the ship through watertight doors in the steel bulkheads separating the forecastle from the rest of the accommodations.

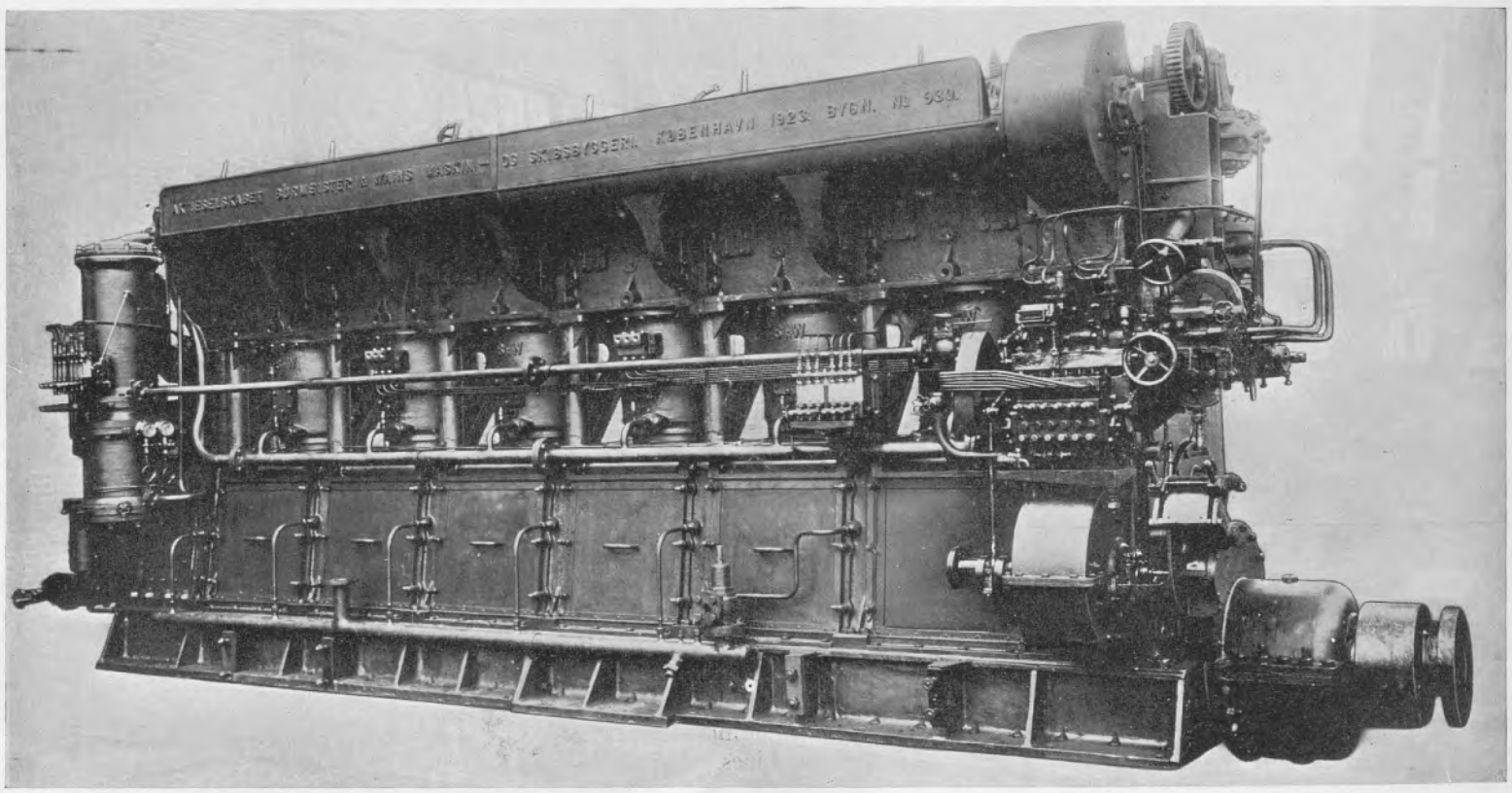
On the starboard side, between the pantry and the forecastle, have been placed the quarters for the stewards' department, there being three comfortably arranged double staterooms, with a well equipped bathroom, and forward of these quarters is the galley, which is very large and has direct overhead ventilation through a separate skylight. On the port side, forward of the dining room, have been placed the quarters for the officers, including a large stateroom with separate bathroom for the Captain, a separate stateroom for the Chief Engineer and two double staterooms for mates and assistant engineers, in addition to a bathroom available for the officers other than the Captain.

In order to reduce the number of the crew to a minimum, every advantage has been taken of the use of auxiliaries which are electric. These include not only a windlass but also electric deck winches for handling boats and for making sail.

The HUSSAR is supplied with electric fans in every part of the living space. Forced ventilation is provided for use at sea when air ports and skylights must be closed, and the quarters throughout are heated by hot water. Included in the auxiliaries is an ice-making machine, and in addition to ample storage space there is a large chill room, the temperature of which is maintained at any desired point by the use of the refrigerating machinery.

The equipment of small boats on this vessel is in keeping with her general character, and these boats have been built in accordance with the most modern practice. Abreast of the forward house are two 22 ft. lifeboats which were built by Burmeister & Wain. The launches, however, were built in the United States, as it was not felt that equally good results could be secured by

*(Concluded on page 649)*



Six-cylinder 600 b.h.p. reversing type, B. & W. engine installed for auxiliary power in the yacht *Hussar IV*

# Interesting Notes and News from Everywhere

The converted motorship BIDWELL, which has a Sun opposed-piston Diesel engine of 3,000 i.h.p., had her engine turned over last month and was expected to leave the builders' yard before the beginning of September.

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Sir Glyn West, Chairman of the Board of Directors of Armstrong Whitworth & Co., the English shipbuilding and engineering firm, is making his first visit to the United States. Interviewed on his arrival, he expressed the opinion that ships of 30,000 tons and over would eventually have electric drive, with oil engines to generate the power.

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Returning from her first voyage, the motorship MILLER COUNTY made an average speed of 10¾ knots from Sabine Pass to Marcus Hook, with a main engine consumption of 52 barrels per day. The engines worked satisfactorily and did not give a moment's trouble. This vessel was reported in our last issue to have completed her trials and to have left on her maiden vayage. She is a converted tanker with a 3,000 i.h.p. Doxford engine built by the Sun Shipbuilding and Dry Dock Co. This engine operates with airless injection, and it is reported that throughout her first voyage the combustion was notably good. After discharging her cargo at Marcus Hook, the vessel went up to the drydock at the Sun yard to have a new propeller installed, after which she proceeded on her second trip.

### Marine Congress in November

One of the activities of the American Marine Congress in November next will be a discussion of ways and means of fostering Diesel engine development in this country. A Diesel engine committee has been established, the chairman of which is Rear-Admiral William S. Benson (Ret.), commissioner of the United States Shipping Board, who is noted for the unflagging interest he has always taken in the development of the motorship.

Admiral Benson has given much thought and study to an organization plan for such a committee, and his proposed organization, as outlined below, has met with the approval of those charged with the direction of the American Marine Congress.

The following is a classification of the various groups to be represented:

A. Manufacturers of Marine Diesel Engines; B. Manufacturers of Small Diesel Engines for Propulsion or Auxiliary Purposes; C. Manufacturers of Marine Auxiliary and Electrical Equipment; D. Shipyards and Ship Repair Plants; E. Manufacturers of Miscellaneous Appliances Specially Applicable to Motorships; F. Manufacturers of Stationary Diesel Engines; G. Ship Operators; H. Advisory Group.

Membership of the group committees will be announced when the invitations have been accepted.

## *World's Record of New Construction, Ships' Performances and Other Matters of Note*

The American Marine Association will hold its Third Annual Marine Show in the Grand Central Palace during Marine Week, November 5th-10th, at which time the American Marine Congress will also be convening.

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Gossip in Eastern shipping circles has it that several groups are being formed to purchase vessels from the Shipping Board for conversion to Diesel power. Shipyards and engine builders confirm that they have received inquiries for the cost of conversion of a number of steamers, but it is not believed that any of the plans have gone beyond the promotion stage.

### U. A. L. Intercoastal Service

In the latter part of August the United American Lines announced that beginning September 8th they would enter between 12 and 14 modern vessels in a weekly service between Baltimore and New York and Pacific Coast ports of the United States.

The United American Lines have taken over the branch offices in Pittsburgh and Buffalo heretofore maintained by Houlder, Weir & Boyd. C. H. Sprague & Son will act as agents at Boston, and Trosdal, Plant & Lafonta at Philadelphia, succeeding the American Hawaiian Steamship Company as U. A. L. representatives at those ports. The United American Lines maintain branch offices at Baltimore and Chicago.

With the inauguration of this joint service, Houlder, Weir & Boyd, Inc., will cease intercoastal activities except as they pertain to their interest in the new service, which will be under the sole management of the United American Lines. The latter will take over practically the entire staff of Weir & Boyd's Intercoastal Traffic department, including M. T. Noblett, who, as freight traffic manager, will be in charge of the service under the general direction of Christian J. Beck, Vice-President in charge of freight traffic.

The Pacific Coast organization will be under the general supervision of Dudley W. Burchard, who was recently appointed Pacific Coast manager of the United American Lines with headquarters in San Francisco. The Los Angeles Steamship Company will represent the service in Los Angeles; Sudden & Christenson, Inc., in San Francisco and Seattle, and the Columbia Pacific Shipping Company in Portland.

There is no relationship between this newly established service and the service which has been conducted in the past, and will still be continued, by the American-Hawaiian Steamship Company. This statement is made in view of the fact that the past connection of the two companies may lead to confusion in the minds of shippers unless it is explained.

The American Hawaiian S. S. Compny's motorship CALIFORNIA was in New York and Boston last month.

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CHASTINE MAERSK, the latest A. P. Moller motor vessel, called at Perth Amboy last month on her maiden voyage. She is bound for Bombay, India. This vessel, which is 378 ft. 2 in. long, carries 7,700 tons d.w., and is equipped with two Burmeister & Wain engines of 1,100 i.h.p. each.

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On her maiden voyage the motorship RHEINLAND of the Hamburg-American Line came into Boston at the end of July and after discharging proceeded to New York. This vessel, like the motorships HAVELLAND and MÜNSTERLAND of the same line, has an installation of submarine type M.A.N. engines with reduction gears. There is another ship of similar type named the ERMLAND owned by the same company, which has not yet visited North American ports.

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For use in Chesapeake Bay, the Standard Oil Co. of New Jersey has ordered a Diesel-electric barge which will be 210 ft. long, 38 ft. wide and 16 ft. deep, with a capacity of 11,000 barrels. This boat, which will have a speed of about 9 knots, will obtain power from two McIntosh & Seymour engines, which will drive Westinghouse generators of 185 k.w. at 275 r.p.m. The main Westinghouse motor will be of 455 h.p. and will drive the propeller at 100 r.p.m. The barge will be electrically equipped throughout. All the electrical equipment has been ordered from the Westinghouse Electric & Mfg. Co., of Pittsburgh. The hull will be built by the Newport News Shipbuilding & Dry Dock Co.

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### Carriers on New York Barge Canal

The following three carrying organizations are now operating, or have given notice of their intention to operate, motor vessels on the New York State Canals—

INTERWATERWAYS LINE, INC.,
42 Broadway, New York City.

Operates five steel motorships of 1,500 tons capacity each, in a bulk cargo service between New York and Buffalo.

MINNESOTA-ATLANTIC TRANSIT COMPANY,
Alworth Building, Duluth, Minn.

Will operate two Diesel-electric 2,300 ton motorships in package freight service between New York City and Duluth.

TRANSMARINE CORPORATION, CANAL DIVISION, 5 Nassau St., New York City.

Operates thirty 400-ton steel barges with five towing tugs, two of which are motor tugs. Service rendered comprises bulk cargo movement between Buffalo and New York Harbor ports.

The Standard Oil Company, of New York, is also using Diesel-engined boats on this service.

The British India Steam Navigation Co. is reported to be planning to use two 8,000 ton motorships on the Calcutta-Japan service.

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It is reported that Swan, Hunter & Wigham Richardson have received an order from American owners for two motor vessels of 8,400 tons d.w.c. each, which will be equipped with two-cycle Neptune-Polar engines.

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Commander K. W. Craven has succeeded Sir James McKechnie as Managing-Director of Vickers, Limited, Barrow, England. Sir James McKechnie, who so long and ably fulfilled the duties of the chief-executive position at Barrow, will retain his seat on the Board of Directors of the company.

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Owing to labor disturbances there has already been some delay on the construction of the hull of the M. S. GRIPSHOLM now building for the Swedish American Line at the Armstrong Whitworth yard in England. It is not expected that the ship will be launched until the summer of 1924. This is the big vessel which is to have the double-acting Burmeister and Wain engines.

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A small motor vessel for the New Zealand coastwise trade was recently launched in Scotland and named the INAHA. She is 110 ft. long, 23 ft. beam and has a depth of 10 ft. 3 in. Her owners are the South Taranaki Shipping Company, Ltd. of Pitea, N. Z., who will use her for the shipment of dairy produce from their own stations to Wellington, N. Z., for which purpose she will have insulated holds. Her twin-screw oil engines were built by Plenty & Son, and are of 300 h.p. All the auxiliary machinery is electrically driven.

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Another motor tanker has been ordered by the owners of the motor tankship ELBRUZ, which was placed in service in 1914. Both hull and machinery will be built by the Armstrong & Whitworth firm in England, the machinery to be of the Sulzer type, consisting of two four-cylinder engines of two-cycle design developing a total of 2,700 s.h.p. This vessel, which will have a deadweight capacity of 10,100 tons, will be 440 ft. in length, with an extreme breadth of 67 ft. 6 in. and a moulded depth of 33 ft. 11 in. Her owners are the Société d'Armement et de Commerce, of Antwerp.

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A large two-cycle double-acting Diesel engine is being constructed for experimental purposes by the British Admiralty and will be installed in a special building now in course of erection at the Admiralty Engineering Laboratory, states the *Engineer* of London. The engine will be of the high-speed type with super-charging arrangements, and it is expected that the horse-power per cylinder will be higher than has hitherto been obtained from cylinders of the same size, either of the four-cycle or the two-cycle double-acting type. The purpose of the experiments is to increase the range of application of high-speed Diesel engines to naval problems.

Two representatives of the General Electric Co., of Schenectady, have been sent over to England to attend the trials of the motorship LA PLAYA, the first of the United Fruit Co.'s Diesel vessels, three of which are now building at the yard of Cammell, Laird & Co., Birkenhead, England.

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The Ocean Steamship Co., of Liverpool, operated by Alfred Holt & Co., has ordered two more motor vessels. The hulls will be built by the Caledon Shipbuilding Company in Scotland, and the machinery will be of the Burmeister and Wain type, with two main engines aggregating 4,800 i.p.h.

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It is stated that an increase of nearly 20 per cent has been obtained in the passenger accommodation of the new 600 ft. motor liner which the Fairfield Company is building on the Clyde for the Union Steamship Co. of New Zealand, this increase being in comparison with a steamer of the same tonnage.

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One of the two motorships recently ordered by James Chambers & Co., of Liverpool, will be a single-screw vessel with North Eastern-Werkspoor Diesel engines. The power is not yet definite.

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A 3,500 b.h.p. submarine-type airless-injection oil-engine is now under construction at the Barrow plant of Vickers, Limited. It is an eight-cylinder design of the four-cycle type, to turn at 390 r.p.m., and has cast-steel cylinder-heads and frames.

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Andrew Weir & Co., of London and Glasgow, have placed a contract with Harland & Wolff for three additional vessels, each about 400 ft. in length. Although it has not yet been reported what machinery these ships are to have, it is assumed that, like the six vessels previously ordered by the same owners earlier in the year, they will be equipped with Burmeister & Wain type engines constructed in the Harland & Wolff engine works at Glasgow. The keels cannot be laid until some of the vessels now on the ways at the Govan yard have been launched. Such activity today is found only in the yards that are specializing in motorship construction.

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A long-stroke, crosshead-type engine with uncooled pistons has recently been under test at the Vickers plant in England. It is of the direct-reversible four-cycle type, with six cylinders 18¼ in. diameter and 27 in. stroke, designed to turn at 150 r.p.m. developing 600 shaft h.p. The piston speed of 675 ft. per minute is lower than is ordinary in marine oil-engine work at the present day, but is very favorable to the radiation of heat from the pistons to the air. The exhaust valves are water cooled. This engine, which is the first of its size built at Barrow, is for the coastwise motorship building in Japan to the order of the Mitsubishi Zosen Kaisha. This vessel, which is to be 177 ft. long with 28 ft. moulded breadth, will have a displacement of 800 tons loaded.

Six Neptune Diesel-engined motorships are now under construction at the yard of Swan, Hunter & Wigham Richardson, Newcastle-on-Tyne, England.

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### Tests On a Large Oil-Steam Engine

One of the combination oil-steam engines built under the Still patents by Scotts' Shipbuilding & Engineering Co., of Greenock, Scotland, has completed its trials at the builders' works. This engine, which develops 1,250 b.h.p., is one of two motors for installation in an 8,000 tons vessel building in Scotts' yard to the order of Alfred Holt & Co. This is a sister ship of the single screw motor vessel MEDON, which was completed by the Palmer Shipbuilding & Iron Co., Ltd., at the end of May and has a four-cycle Burmeister & Wain engine of 3,000 i.h.p. By comparison between these two boats, the Ocean Steamship Co. (A. Holt & Co.) will thus get a close line on the superior economy expected from the Still type of engine. In this design the fluid in the jackets is maintained at a temperature of about 350 degrees F., and is circulated around a boiler raising steam to 120 lbs. per sq. in., which is supplied to the underside of the working pistons. The Diesel side of the cylinder is operated on the two-cycle principle with scavenging effected by means of a turbo-blower driven by a small turbine utilizing exhaust steam from the main engines. It is hoped that the fuel consumption will be reduced to 0.37 lb. per shaft h.p. hour.

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### A Progressive Italian Shipping Firm

For the Societá di Navigazione Roma, of Rome, Italy, a second motor vessel was recently launched and christened CANEPA. She is a Diesel engined tanker 377 ft. in length, 51 ft. 6 in. extreme breadth and 35 ft. moulded depth. On a draft of 24 ft. 2 in. she can carry 7,800 tons d.w. She was launched complete with her two Sulzer engines aggregating 2,500 s.h.p. at 120 r.p.m., which will drive her at 10½ knots loaded. The fuel consumption is expected to be about 10 tons daily. Except for her two cargo pumps, which have a capacity of 600 tons per hour and are steam operated, all the auxiliary plant is electrically driven. There are two 50 k.w. Diesel dynamos, turning at a speed of 500 r.p.m., supplying power for engine room auxiliaries. The vessel was built by the Cantieri Officine Savoia at Cornigliano Ligure. The Roma firm owns the VEJO, which has now been in service for more than a year, and is a vessel of 8,100 tons d.w.c. propelled by two 1,100 b.h.p. San Giorgio two-cycle Diesel engines. A third motor vessel to be named FALERIA, which will be a sister ship to the VEJO, is now under construction at the San Giorgio shipyard at Spezia. This will make three motorships in a fleet of 17 vessels. Most of the boats owned by the company are of modern construction, only four having been built prior to 1918. These four, however, are between 20 and 30 years old, and there is little doubt that their place will be taken by motorships.

### Latest Motorship Incorporations

It is stated that 75 per cent of the capital has already been secured for the California Steamship Line, recently chartered under the laws of Delaware. This company was incorporated by P. Kleppe—a Norwegian shipowner, Capt. W. A. F. Smith—who is stated to have been connected with the Bethlehem Shipbuilding Corp.—J. H. Torney and H. Kleppe. Five refrigerator vessels are reported to be planned by this new organization, the vessels to be of 11,000 tons each, with a speed of 15 knots. It is believed that the order for the engines will be placed abroad, because domestic builders cannot make the delivery required of engines of such large power as will be needed. The Shipping Board is said to have agreed to issue a loan equal to 66 per cent of the value of the ships.

The Motorship Service Corp., of San Francisco, which has previously been referred to in these columns, has been reorganized under the name of the Ocean Fruit Express. This company was incorporated for $10,000,000 last year, for the purpose of operating a number of combination passenger and refrigerator vessels of 18 knots speed in the Inter-Coastal service. No vessels have yet been ordered.

Another refrigerated fruit line lately announced is the California-New York Steamship Company, the directorate of which includes Los Angeles, San Francisco and New York men. The company has announced that it will reduce the rate of oranges to the Eastern markets to $0.90 a box, thus cutting the all-rail rate of $1.73 per 100 lbs. Oranges are packed 78 lbs. to the box, and the water rate will therefore be equivalent to $1.15 per 100 lbs.

One of the Nordstjernan Line motorships, CANADA, discharged a big cargo recently at San Pedro, Calif.

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A large cargo of European cement was landed recently at Los Angeles by the Danish motorship LEISE MAERSKE, which flies the flag of A. P. Moller. The vessel proceeded to San Francisco, Columbia River and Puget Sound.

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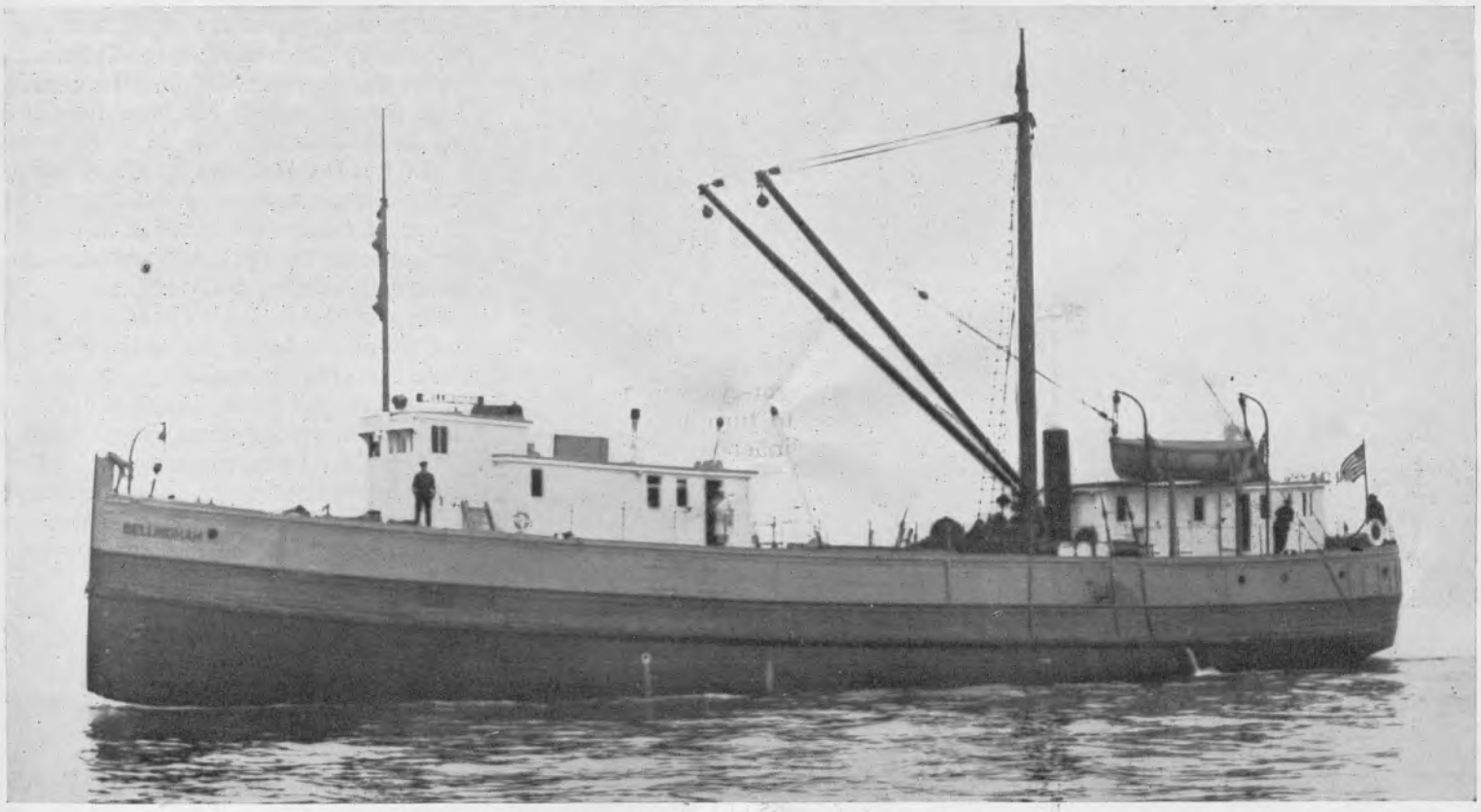
A slight fire in No. 5 hold was reported by the M. S. EKNAREN on her arrival at Colon, C. Z., last month. This vessel is owned by the Transatlantic Steamship Co. of Gothenburg, and was en route from Europe to Seattle, where she is due early this month to enter the Australian service from Puget Sound.



*Bellingham*, 41 years old, now has a 200 h.p. oil-engine, and is operated by a canning company

A 400 h.p. Diesel-engined tug will be seen in Puget Sound waters when the former Army minelayer LIEUT. HAROLD B. DOUGLASS has been converted. The Cary-Davis Tug & Barge Co. bought this vessel from the War Department and will tear out the steam machinery. She is 105′ long with a beam of 24′.

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After two years in the intercoastal trade as a unit of the Williams Steamship Co.'s fleet, the motorship KENNECOTT has been withdrawn and is being operated by the Alaska S. S. Company for its own account. The announcement of this pending change was made in our last issue. The KENNECOTT loaded a cargo of lumber on Puget Sound last month for Yokohama and will return to Seattle from the Orient via Alaska, where she will load copper ore from the Kennecott mines for the big smelter at Tacoma, Washington.

### Old-Timer Converted to Motor Power

Now carrying supplies from Puget Sound to canneries in the North and returning with canned salmon, the BELLINGHAM, 41 years old, is doing better with motor power than she ever did in her long steam career. As reported in our July issue, this vessel has had a 200 b.h.p. Fairbanks-Morse oil-engine installed, to the order of the Sunny Point Packing Company, her present owners.

Though it is generally held that this boat was built in Astoria in 1882, it is maintained by some that she was originally built as a schooner in 1879. The first definite knowledge of her is that she was used as a tug under the name GENERAL MILES at the mouth of the Colombia River, but during her early years she seems to have gone wherever business could be obtained. In the '80's she did a general freight, passenger and towing business between Astoria and Portland.

About 1890 she was sold to new owners and then chartered for Puget Sound service where she carried passengers and freight between Port Townsend and the San Juan Islands. In 1890 she returned to the Columbia River.

In 1891 she was cut in two, lengthened 36 ft. and extensively refitted as a passenger vessel. Her new dimensions were 136 ft. by 22 ft. by 10 ft. depth. In 1894 she returned to Puget Sound, and in 1895 was sold to the Alaska Steamship Company.

Two years later she stranded and was considered a total loss, but was salvaged, and after repairs ran under the Canadian flag for the Canadian Pacific Navigation Company. In 1902 she returned to American ownership and went into service between Seattle and Bellingham and has since been on various Puget Sound runs.

# A Submarine Mother Ship

ONE of the many interesting marine installations made by The New London Ship & Engine Company, of Groton, Conn., is the submarine tender or mother ship ISAAC L. RICE. This vessel, inasmuch as it is not equipped with propulsive machinery, can also be termed a permanent floating submarine base.

Shortly following our entry into the World War, the Electric Boat Company, which owns the construction rights and patents for the Holland type of submersibles, realized the need of a satisfactory mother-ship to care for the submarines then building for the U. S. Government. A floating base was decided upon, and plans were developed by the Hull Department of the above company, providing for a barge shaped craft, 130 feet long by 38½ feet breadth. Spacious living quarters, consisting of staterooms, lavatories, messrooms, etc., are arranged for the accommodation of submarine officers and crews. Similar quarters are given over to the vessel's crew and representatives of the Electric Boat Company. The hull, built by the Thames River Shipbuilding Company of New London, Conn., was launched late in 1917.

Inasmuch as the principal duty of a craft of this type is the charging of the submarine's storage batteries and the effecting of small repairs promptly, she was equipped with two Nelseco-built marine engines for generation purposes. These engines are of the four-cycle type with eight cylinders, 9 in. bore by 12½ in. stroke, and develop 240 b.h.p. at 350 r.p.m. At the forward end of the engine there are two compressors for supplying air for injection and starting purposes, provision being made on four working cylinders for starting by means of compressed air. The compressors are of the two-stage tandem type, and provision is made for regulating the pressure of the spray air by means of a throttle on the first stage suction. The bed plate is in two pieces, of cast iron, and is enclosed to catch all oil draining from the bearings. The housing is in two pieces of rigid cast iron and is bolted directly to the bed plate. Large openings are provided on both sides to render easy access to the crankpit. On top of the housing are bolted the working and compressor cylinders and camshaft bearings.

The engines are direct connected to General Electric d.c. generators, which supply the current necessary for driving the ship's auxiliaries and charging submarine batteries. Fire-, bilge- and circulating-water pumps are electrically driven, as is also an Ingersoll-Rand 20 cu. ft. per hour, three-stage air compressor. This compressor compresses to 2,000 lbs. per sq. in. and supplies the submarine's air flasks when required. A small, but very complete, machine shop, equipped with electrically driven lathes, drill press, etc., is adequate for making minor repairs quickly. A small auxiliary lighting set is also provided. The vessel is steam heated, and for this purpose a small oil-fired boiler was installed.

Shortly after the craft was placed in commission, she was chartered by the Government and taken to Provincetown, Mass. Since then she has been brought to New London, where she is at present. The fact that she has been in constant operation since her launching is ample proof that she has satisfactorily filled a long felt need.

Submarine tender *Isaac L. Rice*, which has been in constant operation for over 5 years

### Lake Pontchartrain Ferry

A speed of 12 miles per hour is made by the ferry boat which the East Pontchartrain Ferry Co. runs across the lake from Slidell, La. This boat, which measures 68 ft. along the keel, 23 ft. 6 ins. beam, draws 5½ ft. of water and is propelled by a 100 h.p. Frisco Standard oil-engine. She has capacity for between 12 and 15 autos in addition to her passenger accommodation.

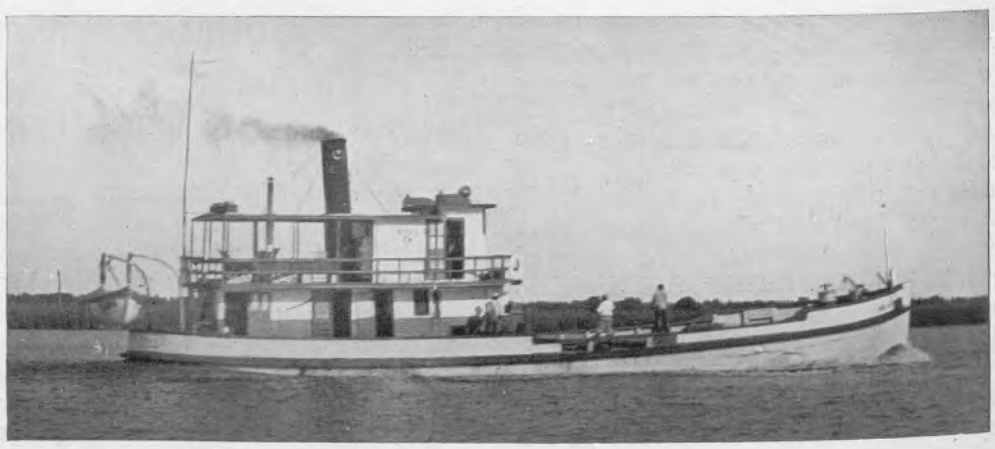
### Continuous-Seat Piston Rings

Engineers troubled with blowing from the cylinders or serious loss of compression due to excessive wear of the cylinder liners can in many instances ameliorate the conditions by the use of special piston rings. A recent instance of the effectiveness of this sort of remedy has been furnished by an experience with the M.S. KENNECOTT.

In April of last year her Chief purchased eight Eclipse two-seat piston rings for test. Four of these were installed in one of the cylinders on the starboard engine, where the liner showed a taper of 0.085 in. Two rings were installed in No. 2 cylinder and another couple in No. 6 cylinder of the port engine. The blowing immediately stopped from these three cylinders. It then remained to be seen how long these rings would last.

The Chief was encouraged, by the results he was getting, to order the same type of rings for every cylinder on both the main engines as well as on the auxiliary engines. The four rings installed in No. 1 cylinder have been used during voyages totalling 50,000 miles and have been transferred to a new piston in a new liner. The Chief states that he expects to get 200,000 more miles from these same rings, because they are still in practically as good condition as new. Not only did the rings stop the noise of the blowing from the cylinders, but the cessation of the blowing also eliminated the oil vapor from the engine room. A reduction in the lubricating oil consumption was also made to about one quart per watch.

There is a very simple practical explanation for the performance of these Eclipse rings, namely, they have two continuous seats where the pressure is held.



Lake Pontchartrain Motor Ferry has a capacity of 12 to 15 automobiles

# Diesel Yacht Tanino Has Gyro. Stabilizer

THOUGH a large number of the able 110-ft. sub-chasers, used by the American Navy during the war, have been bought by private parties and converted into yachts, in most cases the original power plants have been retained, excepting the center engine which is usually dispensed with. The original equipment consisted of three 220 h.p. Eastern Standard six-cylinder gas-engines, driving triple screws and designed to give the boats a speed of about 18 knots. With two engines an economical cruising speed has been found to be 10½ to 11 knots on a fuel consumption of about 24 gallons of gasoline an hour for the two engines. For short bursts of speed as high as 14 knots may be attained with a fuel consumption increase reported as 50 per cent. Around Puget Sound and in Southern British Columbia waters the price of gasoline ranges between 25 and 30 cents a gallon, while further north it comes at 50 cents a gallon or more in some places. On account of the high cost of operating these converted chasers on gasoline, purchasers of these craft have lately begun to turn to Diesel power as a solution of their difficulties.

A fine example of what can be done in converting these craft is the American Expedition Association's yacht TANINO, reconditioned at Seattle this year in accordance with plans by K. H. Scheel, and equipped with twin 65 h.p. three-cylinder Atlas-Imperial Diesel engines in place of the original gas engines.

The TANINO has been chartered by Wm. Lloyd, of Chicago, and arrived at Vancouver, B. C., early July, her first stop on a trip from Seattle to northern B. C. waters and Alaska. She sailed from Seattle with the painters and carpenters still working on her, and they were sent home from Vancouver.

This yacht has a fuel capacity sufficient for a cruising radius of about 5,000 miles at 10 knots. Chief Engineer Fitzpatrick states that on the run from Seattle to Vancouver she averaged 10 knots on a total fuel consumption of 5⅝ gallons per hour for both engines, the fuel used being Diesel oil of 24° Beaumé. The lubricating oil consumed was 1 quart per hour for both engines.

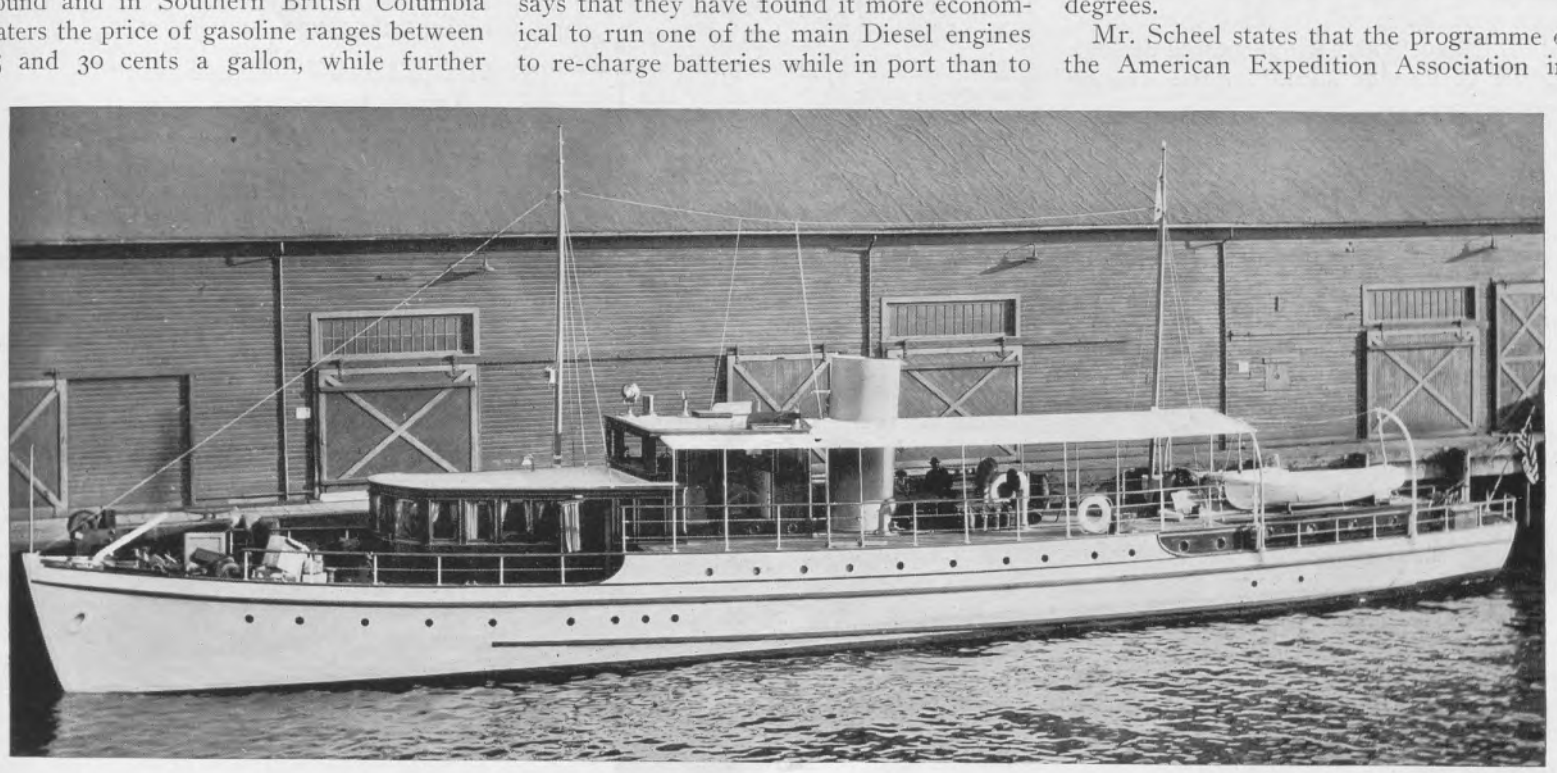
The auxiliaries consist of a 4½ k.w. generator run off each of the main engines, while each engine also has a bilge and fire pump attached. There is also the Standard 8 h.p. two cylinder gas engine, with air compressor, running an additional 4½ k.w. generator, this being the auxiliary engine of the original equipment. The generators charge a 68-cell Exide battery, which supplies current to the electric windlass, Corbin ice machine of ¼ ton capacity, and water service pumps. Mr. Fitzpatrick says that they have found it more economical to run one of the main Diesel engines to re-charge batteries while in port than to run the 8 h.p. auxiliary gas engine, the cost of fuel for the 65 h.p. Diesel engine only being half that for operating the 8 h.p. gasoline motor.

The boat is heated throughout with steam from a heater located in the galley, burning the same fuel as the main engines. Hot water, both fresh and salt, for the domestic supply, baths, etc., is heated by the galley stove, fitted with oil burners, the water being delivered under pressure by a pump which starts up automatically when a faucet is opened.

A Sperry Gyroscope stabilizer is one of the interesting features of her engine room. The main gyro, weighing with its spherical casing and mountings about 4 tons, is installed at the after end of the engine room, being set low between the propeller shafts, while a small gyro that controls the stabilizer by means of electric contacts is placed to one side. The main 2½ ton gyro wheel is driven by a 6 k.w. 110 volt d.c. motor, and is said to take about an hour to work up to its full speed of 2,700 r.p.m. at which it exerts a stabilizing effort of 18 ft-tons. This speed, however, is only required in a heavy sea; for a moderate sea the gyro being run at half speed. When running at full speed the outer travelling surface of the gyro wheel is said to be moving at 3 miles a minute, and it is so delicately balanced that it will coast for four hours after the power is shut off.

Mr. Scheel, who came up with the yacht as far as Vancouver, stated that a test of the stabilizer had been made in the open sea about 30 miles to the westward of Cape Flattery on June 30th, during a 30 mile S.W. breeze. He said that with the present arrangement of fuel tanks the boat proved herself to be naturally very steady, her maximum roll in the beam sea being through an arc of 25 degrees, without the stabilizer in operation, and when the gyroscope was run at full speed this was reduced to 4 degrees.

Mr. Scheel states that the programme of the American Expedition Association includes the conversion of three more sub-chasers which will be fitted with gyroscope stabilizers and Diesel engines. The next boat to be converted is to have two 100 h.p. six-cylinder Atlas Diesels, which are expected to give a speed of 13 knots.



American Expedition Association's Diesel Yacht TANINO

*Photo by H. M. Warner, Seattle*

### Port Angeles-Victoria Ferry

The Puget Sound Navigation Co. is reported to be having designs made of an ocean-going type of automobile ferry to be ready next spring for the run across the Straits of Juan de Fuca from Port Angeles, Wash., to Victoria, B. C. The new boat is to be Diesel powered, and while two round trips a day are planned at first she will be able to make three round trips when business warrants, carrying 23 automobiles. This route is now served by the steamer SOL DUC. The Puget Sound Navigation Co. and Navy Yard Route, owned by the same interests, operate the ferry PUGET on the Seattle-Port Ludlow route and the CITY OF BREMERTON on the Navy Yard route, both converted from steam to Diesel power.

Krupps are reported to have orders for 12 oil-engined tankers, including three for Standard Oil interests.

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A 2,550 tons d.w. motorship built to Lloyd's highest class in 1920 and formerly named the DANEDRONNING has been purchased by the Grimstad Shipping Co., Ltd., which has renamed her the GROSHOLM.

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A motor tanker to carry 12,800 tons d.w. has just been ordered in Holland by Westfal, Larsen & Co., the well-known shipowning firm of Bergen, Norway. The hull is to be built by the Netherlands Shipbuilding Company, while the machinery will be supplied by Werkspoor, of Amsterdam. The twin-screw installation will comprise two six-cylinder engines giving about 3,200 shaft h.p., the cylinders being of 26⅜ ins. diameter with a piston stroke of 47¼ ins. Steam auxiliaries will be fitted throughout, and the exhaust gases will be passed through a boiler to provide steam for the steering engine at sea.

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According to reports from Holland, a 15-knot Spanish steamer is expected shortly at the yard of the Fijenoord Company at Rotterdam for conversion to Diesel power. The boat in question is the J. J. SISTER owned by the Compañia Trasmediterranea, of Barcelona, Spain. She is an old boat, built in 1896, and is 283 ft. 6 in. long, with 36 ft. 10 in. breadth and 18 ft. 9 in. depth. Her gross register is 1,514 tons. Her steam machinery consisted of two double ended boilers and a triple-expansion engine of about 4,000 i.h.p. She will have a Diesel installation similar to that of the Hamburg-American boats HAVELLAND, MUNSTERLAND, RHEINLAND and ERMLAND, consisting of two M.A.N. engines of the submarine type, built for 3,000 b.h.p. at 380 r.p.m., but reduced to a maximum of 200 r.p.m. giving 1,500 b.h.p. and driving through reduction gears.

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### French Coastwise Tanker "Atar"

There was recently completed in one of the yards in the south of France a tanker intended as a bunkering vessel for the port of Marseilles or at sea. She is a single-screw boat, about 120′ feet in length 25′ 6″ beam, and about 12′ 6″ moulded depth. The hull is divided by seven water-tight transverse bulkheads. Three of the compartments are for oil, and a fourth contains all the machinery. For driving the vessel there is a two-cylinder Bolinder engine of 175 b.h.p. turning at 226 r.p.m., giving her a speed of about seven knots. In addition to this main engine, there is an auxiliary Bolinder motor of 50 b.h.p. Under ordinary circumstances, this smaller engine drives the cargo pump, but arrangements have been made to enable the pump to be driven alternatively by the main engine. For this purpose the connection between the engines and the pump is made by a chain drive, which incidentally permits the auxiliary engine to be coupled to the tail shaft, so that the boat can be handled with certainty and ease at a speed below four knots.

All the Tuxham oil-engines exhibited at the Rio de Janeiro exhibition were sold in Brazil. The Grand Prix was awarded to the Tuxham engine.

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PHOEBUS, the latest motor tanker put into service by the German-American Petroleum Co., of Hamburg, was in New York at the beginning of August, after a very successful maiden passage from the other side. She ran her contract trials on July 14th, and it speaks well for her Sulzer engines that she was at Perth Amboy at the end of that same month.

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Built by the German Government on reparations account for Italy, the motor tanker URANO ran trials recently at Kiel, where she was built. She is a vessel of about 8,000 tons deadweight, measuring 397 ft. in length, 54 ft. moulded breadth and 30 ft. 6 in. moulded depth. Her propelling engines are two 950 h.p. Diesels, of the four-cycle type developed by the Deutsche Werke A. G., which is the company that has taken over what was formerly the Imperial Navy Dockyard at Kiel. These engines each have six cylinders and 21⅝ in. diameter and a stroke of 35$\frac{7}{16}$ in. They turn at 135 r.p.m. and drive all their own auxiliaries, including spray air compressors and pumps for the lubricating oil, cooling water, piston cooling and general ship's service. The only separate auxiliaries in the engine room are a Diesel driven compressor and a dynamo.

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### Pilot Boat for Dutch Government

In its orders for new pilot boats the Dutch Government is showing a preference for motor power. Some years ago it ordered its first motor boat for pilot service and stationed her at Terschelling, one of the Northern Islands of Holland, where she has since been giving unbroken satisfaction. Last year when a new boat had to be ordered for the service at Flushing, at the mouth of the River Schelde, the order was placed for a motor vessel. She has now been commissioned, and, as will be seen from the accompanying illustration, is of a design to suit the short steep seas encountered along that coast.

She has an Atlas-Polar engine of 200 b.h.p. turning at 210 r.p.m. This is the well-known two-stroke type of Swedish Diesel engine in which no starting air is admitted to the power cylinders, but is utilized instead in the scavenge air pumps which are direct driven from the main crankshafts. The air-compressor for starting and maneuvering is automatically kept at about 200 pounds pressure, but starting can be accompanied with even a lower pressure.

The auxiliary engine is a very interesting little unit, consisting of a single-cylinder four-cycle Diesel engine of 12 h.p. driving a two-stage air-compressor. An emergency air-compressor operated by hand is also installed. The contract speed of 10½ knots was obtained with a mean indicated pressure of about 85 pounds per sq. in. in the engine.

KRETA and SYRA, the two Diesel engined tankers for the German Levant Line, are nearly completed at the Howaldtswerke.

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It is again reported that the Messageries Maritimes, a French shipping company in the trade between French ports and the Orient, is about to order a motorship of about 5,400 b.h.p., the engines of which are to be built abroad.

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### Large Motor Tanker for Standard Oil Interests in Germany

One of the motor tankers for the Deutsch Amerikanische Petroleum-Gesellschaft made her trials in Kiel Harbor about the middle of July and started immediately afterward on her maiden voyage. This vessel will be known as PHOEBUS, and was built by the Howaldtswerke under special survey of the Germanische Lloyd and to its highest class $100\frac{A}{4}$.

Her principal dimensions are:

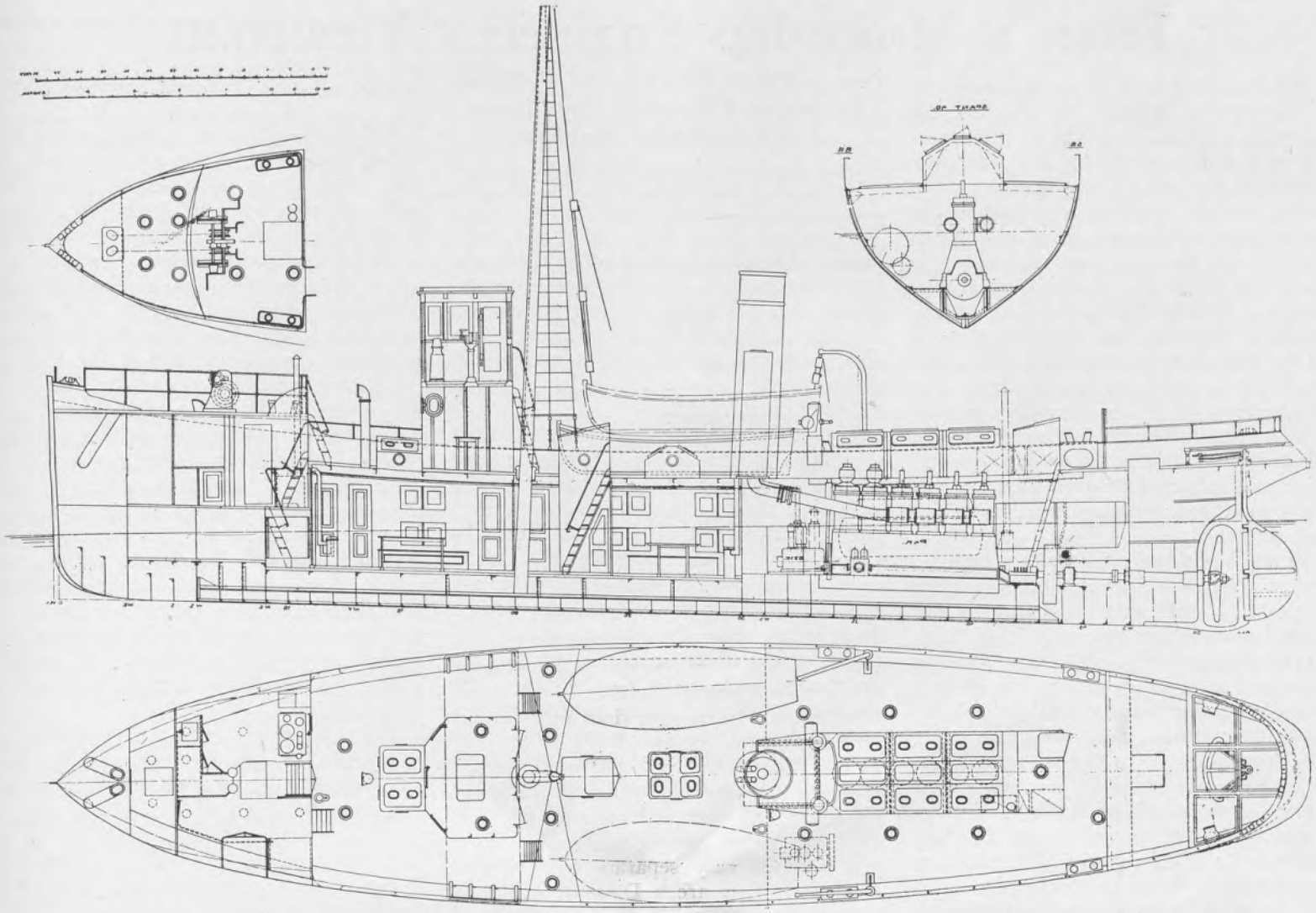
| | | |
|---|---|---|
| Length between p.p. | 501 ft. | 3 in. |
| Breadth, extreme | 64 ft. | 0 in. |
| Depth, moulded | 39 ft. | 4¼ in. |
| Draft, loaded | 26 ft. | 10 in. |
| Deadweight capacity | 13,740 tons | |
| Power | 2x1,600 b.h.p. | |
| Engine speed | 85 r.p.m. | |
| Vessel speed, loaded | 11 knots | |

The hold space is divided into 20 tanks, with an oil-tight longitudinal bulkhead running the full length of the tank space. Amidships a pump room divides the forward tanks from the after tanks in two equal groups. In this room two horizontal compound steam pumps are installed, with an hourly capacity of 430 tons each. They are the only steam sets on board, and two oil-fired boilers are provided for their operation.

For propulsion of the vessel there are two four-cylinder Sulzer two-cycle engines built at the German factory of Sulzer's at Ludwigshafen and developing 1,600 b.h.p. each at 85 r.p.m. These engines are self-contained with their own spray-air compressors and lubricating oil pumps, and drive also bilge pumps. The operation of the scavenge air pumps and cooling water pumps is, however, electrical.

For the electric service there are two Sulzer engine generator sets of 180 k.w. capacity each, turning at 180 r.p.m. Either of these sets alone suffices for the operation of all the electrical auxiliaries, the second set being provided merely as a standby. All of the electrical work, with one exception, was carried out by Brown Boveri & Co., the Swiss firm, which has a factory at Mannheim in Germany and is closely associated with the Howaldtswerke. The exception is in the case of the electrical steering engine, the electrical part of which was built by the Siemens-Schückert firm, while the mechanical part was built by the Atlas works of Bremen.

On the contract trials both engines were turned over at 90 r.p.m., giving 3,500 s.h.p., which drove the vessel at over 11¾ knots. On the builders' earlier trials the engines were pushed to 4,000 s.h.p. at 95 r.p.m., giving a ship's speed in excess of 12½ knots.



Arrangement of pilot boat for the Dutch Government with 200 b.h.p. Diesel engine


Pilot boat No. 2, of the Dutch Government, at Flushing, Holland

# From a Motorship Engineer's Viewpoint

***How a Diesel-driven Vessel Suddenly Encountered Troubles After Three Years' Successful Operation***

*(Continued from page 490, July issue)*

I HAD formed the habit of blue-penciling my own work-lists. By that I mean making-out a complete list of necessary repairs, then presenting it to the powers-that-be, and, after listening to a lecture on the absolute necessity of reducing the time in port, cutting-out the things which could be let go until our return. This seemed to please the owners, and always made me—figuratively speaking—kick myself for a spineless fool when I got to sea and thought the thing over. Boosting compression was one thing which always got the blue pencil. When we pulled pistons with our last salt-water experience and a definite time had been set to do the work, which was about four days less than it should have been, boosting compression was again scratched.

On the last voyage the motors were so hard to start that there could be no more letting the compression go, and upon our return I insisted that we would have to adjust clearances. The customary question was raised as to whether it was necessary. I stood my ground, and it was decided that we should carry-out the work.

### Procrastinating with Repairs

I have already explained how heads were cracked as the result of salt-water in suspension. On the voyage before the last, three heads cracked slightly. After holding a conference with the owners, engine-builders, Lloyds' surveyor and the insurance adjuster—I was present, seen, but little heard and less listened to—it was decided that we should attempt to use the cracked heads. I agreed that we could go across the Atlantic and back without serious damage to the motors, if any at all. The owners agreed to have new heads on hand upon our return, and to replace the cracked ones if necessary.

Upon our return I reported that one cylinder-head was actually leaking seawater into the cylinder while the piston was making the suction stroke, and that combustion was being interfered with, but not killed—consequently we should have to change that head and probably two more, as well as at least make a survey of the others, to learn how they were acting since the engine had started functioning normally again.

With our awkward installation these items involved a lot of labor, which was scarce. The owners consulted the engine builders to decide whether my demand was justified, and also asked them what parts they would care to have exposed in order to decide whether the motors were in good condition in other respects. The engine-builders asked to have all heads removed, all valves taken out, and two pistons drawn—this only thirty odd days after all pistons had been removed for cleaning. The owners agreed, and advised me to have the motors in condition to shift the ship up the river, and explained what was to be done.

### The Engine Survey

Perhaps I saw the thing in a peculiar light, but it seemed to me that when such a terrible hullaballoo was kicked up over boosting compression and replacing cracked heads, while such an expensive survey was sanctioned without a quibble, very little confidence was being placed in my judgment. Therefore I tendered my resignation as chief engineer, agreeing to stay until the survey was completed and a relieving engineer on the job.

The survey was conducted with two of the engine-builders' representatives on hand as well as myself and someone from the steamship department. The engineers bore out my statement that heads needed to be changed and compression raised. Little comment was made to me with regard to my part in the condition of things. The cylinders were worn to approximately one-eighth inch oversize at the top, tapering to practically no wear at the bottom. The shoulder at the end of the ring travel, resulting from excessive wear, had to be ground or otherwise done away with, which—to do the thing right—would involve lifting pistons again. However, as I understood it, that was not then the question.

The big question was, could the engine-builders take the ship with the installation as it stood, place the motors in good condition, put their own engineers aboard and guarantee to turn the vessel around in the same time as a steam-ship. I understood that if they could, or would, agree to do that, then the necessary expense of replacing three heads and lifting all pistons to the proper clearance would be taken care of by the owners and the ship sent to sea. I do not know what reply the engine-builders made, but I assume that they would not undertake to do it, for the operation of the vessel was abandoned.

If I were representing the engine-builders and knew the installation as I know it from experience with it, I would not agree to turn that ship around in twice the time of a steam-vessel, with the crew allowed by the owners, the close head-room, the lack of proper racks and suitable store-rooms, and, lastly but most especially, with the poor steam auxiliaries which constituted a part of the installation—provided I had to turn the ship over to the owners at the end of a year or two without having allowed many things to get in bad condition as the result of neglect. However, with suitable alterations, such as the removal of antiquated steam auxiliaries and boilers, plenty of head-room, overhead tracks, good store-rooms, a suitable repair-shop and the same number of men which the ship now carries, I would agree to turn around in even less time than a steam-ship can, and maintain an average unequaled by any steam-ship. I feel that my work on that ship with its poor equipment and awkward installation gave me the best schooling I could have gotten anywhere.

### When an Oil Purifier Should Have Been Used

Before going further, I may mention that owing to the type of the motors—they are the trunk-piston type—some difficulties were encountered with lubrication, which in my opinion would not be the case with a set of crosshead engines. At best we never could get the clean combustion with boiler-fuel, which had been the case with a better oil. As I have already stated, the salt-water partially destroyed the atomizing devices, and, more especially, increased dimensions of the flame-plate holes were manifest. Because we had neither the time nor the men at sea to change fuel-valves as often as should have been done, the poor atomization of the heavy fuel caused large quantities of the unburned substances to find their way past the pistons and into the crank cases. This thick mucky substance went into suspension in the lubricating-oil and circulated over all of the bearings, the Kingsbury thrusts included. The results, while not so terribly disastrous, were not at all beneficial.

The magnitude of the troubles as enumerated was greatly enhanced for reasons probably not so readily apparent to the layman as they were to me.

### Sulphur and Steam

A few examples will suffice. There was in the steam equipment an old feed-water heater used in place of a condenser. Without sufficient cooling surface to condense the exhaust steam, and with no vacuum pump, this heater discharged its condensate to the hot-well at nearly boiling point, which resulted in the hot-well steaming almost continuously. The interior of the engine-room thus was always damp.

Perhaps in a steam vessel this humid condition would not be of much consequence, but with the Diesels it was different. When we were burning fuel which ran as high as three per cent. sulphur, the engine-room had a certain amount of sulphur fumes in it at all times. The steam from the hot-well was constantly condensing upon any and all cool surfaces, more especially the ship's sides and the ventilators. This condensate, which had picked up some of the sulphur fumes, was to a certain extent acidous, and when it came in contact with bright surfaces such as tools, lathe, drill press, cylinder heads, etc., it immediately discolored them with deposits of sulphate of iron and at times pitted them badly. This condition tended to discourage any effort on the part of the crew to keep the place looking clean and orderly. They felt it was a hopeless case. Discouragement on the part of the crew is serious, for it upsets their morale and creates disorder. To save the best tools and spare parts from the action of the acidous condensate, the engineers carried them under their bunks, which caused more dissatisfaction.

### Troubles with the Condenser

The condenser having insufficient capacity also required us to carry far more fresh-water than would have been the case

with a good one, and a certain amount of cargo was consequently displaced. Furthermore, on the same account it was also necessary to feed cold water to the boilers at times, which caused leaking tubes and gave the engineers a lot of work to roll and caulk them.

The condenser tubes often started to leak, causing the boilers to become salted. To remedy this, we blew them regularly to keep down the density, but foaming was more or less common and water often carried over to the generating-sets, on several occasions knocking off a cylinder head or breaking a rod. Trouble with packing on pump rods, steering-engine, generating-sets and the ice machine was taken as a matter of course. The condenser was retubed twice, and heads were removed times without number to tighten the tubes which were expanded into the tube sheet. The double retubing and numerous repairs amounted to as much as the cost of a new condenser and vacuum pump.

It was always the owners' policy to allow the old piping all over the ship to remain in service until it started to leak. When it would no longer carry the steam, water or cargo, as the case might be, an order for its renewal would be given, but not before.

### Discontent Aboard

The engineers had rooms on the poop deck. These rooms were very small. In winter and in bad weather there were generally from a few cupsful to an inch or two of water on the floor, while in summer they were swelteringly hot because they adjoined the auxiliary boiler room.

The engineers and officers were served by blacks who were paid the princely sum of $20.00 per month—which they never earned. Bed linen was issued once every ten days. No butter was given on night lunch. I do not wish to give the opinion that I am a "sea lawyer," but such things do not tend to create harmony and cause satisfaction.

I had not been on the job long before I learned that a chief-engineer of one of this fleet of ships was little more than nothing, and that his decisions were ready-made and handed to him from the Head office. If he did not care to accept them he could leave. From my discussions with chiefs of their steam-vessels I learned that I was lucky to be listened to as much as I was.

When the unions were in their prime they ran their power into the ground. No one could be more disgusted with the impositions forced upon ship-owners by organized labor than I was. When the rebound came I was fully as much disgusted with the methods of the owners. They threw away my best men with impunity and cut my crew unmercifully.

During the business depression it was difficult to secure employment, and many good men were willing to accept any sort of work rather than remain idle. Under the circumstances I was enabled to drive my crew without fear of losing them when three men were taken off—their work was taken care of by the remainder. That condition could not last.

With improved general working conditions throughout the country, my men started drifting away from me, the First Assistant being the only one who remained, and according to his statement he only remained because he did not like to leave a friend. During the last year of operating that ship I came to depend very much upon him.

The owners could not or would not, recognize the fact that unless they made conditions better for the men they would never hold a crew. In the last year before the ship was taken-out of service, I had an average of a complete turnover of the engine-room force in less than sixty days, excepting the First-Assistant. Some of the lines outbid us with wages. Men went ashore as pipe fitters and machinists, others took to the bootleggers' navy, and some just quit because they were sure of finding a better place. Nothing more need be said in connection with crew.

### Stores and Bookkeeping

A complete system of bookkeeping is most essential upon a ship. I had to keep an account of fuel, water, supplies and lubricants. Well and good! No calibration of the fresh-water tanks was ever made. The fore deep fuel-tank had no sounding pipe, and it was necessary to open the fore-hold, go down to the tank top and remove the manhole plate to get a fuel-tank sounding. If there was general cargo aboard we could not get at the manhole. I made twenty odd voyages, and at the end of each of them I asked that sounding pipes be installed. This was never done, yet I had to give accurate reports of the fuel on hand, but never, with a few exceptions could. There were no fuel meters. The daily-service tanks had gauge glasses for taking readings, but these were never steady, for the vessel in rolling kept them constantly on the move.

Our engine-room stores were kept in three different store rooms and in four engineers' state-rooms. When I suggested that we utilize some available space in an old powder-magazine for suitable storeroom, the steamship department suggested that I add a few boards to my requisition and have the engineers build some more shelves here and there, if we did not have sufficient room to take care of tools, stores, etc.

Because we very seldom had engineers, oilers or firemen aboard in the home port, we had to call in much outside help in doing our routine work. I was supposed to render a report of the number of men who worked on the ship, when each one came aboard, when he left and what he did while aboard, what time he started on each job and when he changed to another. I have had as many as sixty shipyard workers in the engine-room. Can you imagine me rendering a daily report for each individual man? I never did! My reports were inaccurate, and I explained to the steamship department that they were and why, at the same time expressing an opinion that an inaccurate report was worse than none. They agreed with me, but said I would have to do my best, for those were the orders. Overtime and night work were the worst to check.

### The Chief Listens to Elocution

In time one of the officials of the steamship department and myself came to a mutual understanding of the problems which confronted us with regard to this motorship. He showed himself a very broad-minded man. Although he and I did not agree on many subjects, we were in full accord on may others. We expressed our opinions frankly to each other and never had vociferous or wordy discussions over our disagreements, but of course at all times I had to bear in mind that he was the boss.

When we came in with the motors in bad condition as the result of leaking tanks the last time, the representative of the engine builders came aboard to be present for the survey. He, with the ship's master and myself, were called into the captain's quarters to listen to one of the officials of the steamship department, who, I think, is something of an after-dinner-speaker, for to the best of my memory he gave us this talk: "Gentlemen, I have called you together as business men to discuss the problem of this vessel's operation, which has become a serious problem to her owners. You are all business men—the Master and the Chief-Engineer here are both business men interested in the successful operation of this vessel, and Mr. —— is a business man also interested as the builder of the motors which will shortly be under discussion.

"This ship is having a hard struggle to live, perhaps through no fault of any one present. Surely the things which have occurred in connection with her unsatisfactory operation cannot be the fault of any of us. That you all may more fully appreciate the problems which have confronted the owners I will draw a picture of the last year of operation.

"About a year ago the ship left for a European port, and upon that voyage leaks developed in the fuel-tank with disastrous results, of which you are all aware. In order to keep the ship moving, we sent her to sea from a Gulf port without properly cleaning the motors, which resulted in the destruction of the piston-pin bearings and piston-rings, for we attempted to conduct our repairs between voyages. This meant that at the end of each voyage we were delayed several days more than would have been the case had we not encountered the salt-water difficulty.

"After we had completed the repairs to the motors, which were strung out over several months, we hoped to have no more long delays in port. However, last fall the time for Lloyd's Number One survey of the propeller shafts was almost upon us, and thinking it would be better to dock the ship before cold weather set in we decided to call the ship home for docking.

"When we attempted to remove the couplings from the propeller-shafts we found that due to their peculiar construction it was necessary to burn them off and have new ones made. This required time

and the ship was delayed. After the work was completed we sent the ship to another port to load and upon arrival there learned that smallpox had broken-out aboard, so the vessel was placed in quarantine, which caused another serious delay.

"She has since made one voyage across the Atlantic Ocean and encountered heavy weather which cracked a plate in a fuel-tank. Now we have the motors in bad condition again. Because we feel that we made a mistake in not thoroughly cleaning the motors in the South we propose to go to the expense of having them completely cleaned here, which will cause another long and expensive delay.

"Our foreign agency is crying out that it is turning customers from the door and that the competitor is taking the trade. Our Foreign Sales Department is complaining that they will have to charter another ship. We are compelled to work on a very small margin of profit to compete with foreign vessels. As a matter of fact, we can go outside and charter almost as cheaply as we can operate this ship, but we take a pride in our little fleet and wish to hold it together. Our profit is being eaten up by the repairs, while the ship lies idle with expense of insurance, wireless, submarine signal and other items going on continuously.

"We cannot consider this vessel as representing an investment of what she is worth today. She was purchased in war time. We had to make alterations in her construction to accommodate a naval crew. Her original machinery installation was not satisfactory, and we had to make a change. We went to great expense to instal these present motors. All of these items have been added together and represent the money invested, and the stockholders demand a reasonable return for the money invested. Thus we must yield a profit on an investment of approximately three times the vessel's value.

"Now I have not painted this doleful picture in complaint about any one present. I have merely shown you what a struggle this little ship is having, and I have called you together to impress you with the importance of co-operation on the part of us all, to do all we can to remedy the condition and attempt to prevent a recurrence of such unfortunate happenings."

We went into further discussions with regard to boiler-fuel and its more or less unsatisfactory use, more especially in view of the fact that it had been mixed with salt water. We touched very lightly on the problem of the awkward installation, for that has always been a tender spot with the steamship department. The condenser was another sore spot.

### How Steam Melted Money

Before concluding this article I desire to show what the steam-plant cost.

It consumed 20 barrels per day more than motor auxiliaries would. At $1.50 per barrel that was $30.00 per day. The voyages average 35 days, so the increase in fuel-consumption amounted to $1,050.00 per voyage. This required 700 barrels extra, which weighed 100 tons. Consequently that amount of cargo was displaced. At $7.50 per ton this makes $750.00, also it required 7 tons of water per day for 18 days, displacing 126 tons of cargo—or $945.00. Cargo rates then in force are used as a basis for these figures.

Thus we have:

| | |
|---|---|
| Cost of extra fuel consumed per voyage | $1,050.00 |
| Loss through cargo displaced by fuel | 750.00 |
| Loss through cargo displaced by water | 945.00 |
| Total .....per voyage, | $2,745.00 |

The vessel averaged ten voyages per year: consequently the yearly loss amounted to approximately $27,000.00, which would yield a yearly interest of 20% on the investment of $135,000.00 which would cover the cost of changing from steam to motor auxiliaries.

### A Successful Oil Engined Log Towboat

The White Rock Tug Co.'s towboat Almara, converted from steam to oil engine power at Vancouver, B. C., last spring, has been engaged during the summer in towing logs from White Rock, B. C., to Bellingham, Wash., a distance of about 30 miles. Her chief engineer, DeLaunay, states that she has been running very satisfactorily and giving no trouble, handling booms of as many as 19 sections, or approximately three-quarters of a million feet, board measure.

Her 200 h.p. four-cylinder Fairbanks-Morse surface-ignition engine turns a four-bladed propeller of 60-in. diameter and 46-in. pitch at 225 r.p.m. Running light, her normal speed is 8½ knots and the fuel consumption 11 1/10 American gallons per hour. She carries 5,000 gallons of fuel, sufficient for 20 days at full power, and 8,000 gallons of fresh water. Almara, which is 86 ft. o.a. by 17-feet moulded beam, was built at Port Townsend in 1914. At present she is operating under a temporary Canadian license pending an adjustment of the difficulties of getting American built boats under Canadian registry.

DeLaunay states that when she started towing logs she took a 15-section boom over 30 miles from White Rock to Bellingham in 15 hours, and then towed a 10-section boom through in 10 hours. They began to think they could figure out a time table from the number of sections in the boom. Unfortunately a favorable series of big tides had been working, which did not last, and they met a greater percentage of adverse currents on their trips, which sadly upset the time table.

### B. C. Fishery Cruiser

The Forestry Branch of the Department of Lands in British Columbia has decided to go ahead and build a 57-ft. headquarters cruiser at their own plant at Thurston Bay. Tenders were called for, but prices were considered too high. The boat, from designs by J. Winslow, is to be a raised deck cruiser with pilot house forward, 57 ft. o.a., by 13-ft. beam, and equipped with a 50 h.p. two-cylinder Washington Estep Diesel.

### B. C. Forestry Cruiser

It is announced that both engines to be installed in the two 60 ft. fishing vessels for the Department of Marine and Fisheries of the Dominion of Canada, have been purchased from the Crude Oil Engine Company, of Montreal. They will be of the Beardmore type, developing 60 h.p. The award for the construction of the boats was announced on page 480 of our July issue at which time the engine bids were thrown out on account of high price.


Tug *Almara* recently converted from steam to oil engine power

## Cost of Converting an 8,800 Tons S.B. Ship

*(Concluded from page 623)*

required for conversion, with their cost.

EQUIPMENT TO BE RETAINED

1 Boiler
All deck winches
1 Anchor windlass
1 Aux. condenser, with pump
2 Boiler feed pumps
2 Oil feed pumps, with heaters
1 Bilge and ballast pump
1 Sanitary pump
1 Fresh water pump
1 Lighting dynamo
All steam radiators for heating
All machine shop equipment
1 Steam whistle
1 Feed and filter tank

NEW EQUIPMENT TO BE PURCHASED

| | |
|---|---|
| 1 Main engine, 2,000 b.h.p. Diesel | $160,000.00 |
| 1 Aux. engine, 110 b.h.p. Diesel, and 75 k.w. gen. | 12,000.00 |
| 2 Jacket circulating water pumps, 500 g.p.m. | 1,750.00 |
| 2 Lubricating oil cir. pumps, 100 g.p.m. | 1,000.00 |
| 1 Fuel oil transfer pump, 60 g.p.m. | 1,300.00 |
| 1 Fire and bilge pump, 500 g.p.m. | 1,400.00 |
| 1 Engine room bilge pump, 60 g.p.m. | 618.00 |
| 1 Fresh water pump, 40 g.p.m. | 540.00 |
| 1 Steam driven aux. air compressor, 400 cu. ft. | 12,000.00 |
| 1 Electric steering engine | 6,000.00 |
| 2 Daily service fuel tanks | 700.00 |
| 2 Starting air tanks | 4,000.00 |
| 1 Exhaust silencer | 1,600.00 |
| 1 Exhaust heat boiler and oil heating system | 5,500.00 |
| 1 Oil separator | 590.00 |
| 1 Air horn | 80.00 |
| 1 Propeller | 4,000.00 |
| Total | $213.078.00 |

It should be noted that one of the most important factors contributing toward future successful operation of the vessel's machinery is the arrangement of the machinery in the engine room. In laying out the new installation it is not sufficient that space be found for each of the units in the new power plant to fit into. They must be arranged so that free access is provided on all sides for overhaul work, ample lifting facilities must be provided, sufficient overhead clearances assured, and the whole arrangement must be such that the routine maintenance work can be rapidly and easily carried out. Cases can be cited in which rather unsatisfactory performance of converted vessels has been blamed on the type of engine installed, when actually it was due in a large measure to the lack of reasonable maintenance facilities.

Of course, the cost of the shipyard work in connection with this conversion will be affected by the extent to which the owner wishes to go in working out special ideas in machinery or hull arrangements, involving departures from a standardized type. Since the various units in the class of ships under consideration vary somewhat in general arrangement, there will be a corresponding variation in the amount of shipyard work involved. For these reasons it is impossible to name a figure for the shipyard work that will apply to every ship. We may, however, make a fairly close estimate for the purposes of this study, using the machinery arrangement previously described. The total shipyard work will include the following: Removal of old machinery and foundations, possible relocation of some of the steam auxiliaries to be retained, removal of certain parts of the deckhouse to permit removal of old machinery and placing the new, installation of new machinery, removal of forward engine-room bulkhead, patching and altering bulkheads, remodeling of uptake for one boiler, changing propeller, docking, cleaning and painting hull, testing out all old steam lines and repairing leaks, and testing steam winches and placing them in good operating condition. All of the foregoing work will cost about $80,000.

Assuming that the steamer may be purchased from the Shipping Board for $6 per d.w. ton, one can now estimate the total cost of conversion to a motorship as follows:

| | |
|---|---|
| Cost of steamer | $ 52,800.00 |
| Cost of new machinery | 213,078.00 |
| Cost of shipyard work | 80,000.00 |
| Total cost of conversion | $345,878.00 |
| Cost per deadweight ton | $39 to $40 |

Since the low price level of good steamers is about $30 per d.w. ton, and for European built motorships probably not less than $60 per d.w.t., it would seem that the converted Shipping Board vessel at $40 per d.w.t. should be in a very advantageous position in competition with either. Its superior fuel economy should more than overcome the steamer's advantage in fixed charges, and in comparison with the European motorship its smaller fixed charges should overcome the latter's advantage in operating costs.

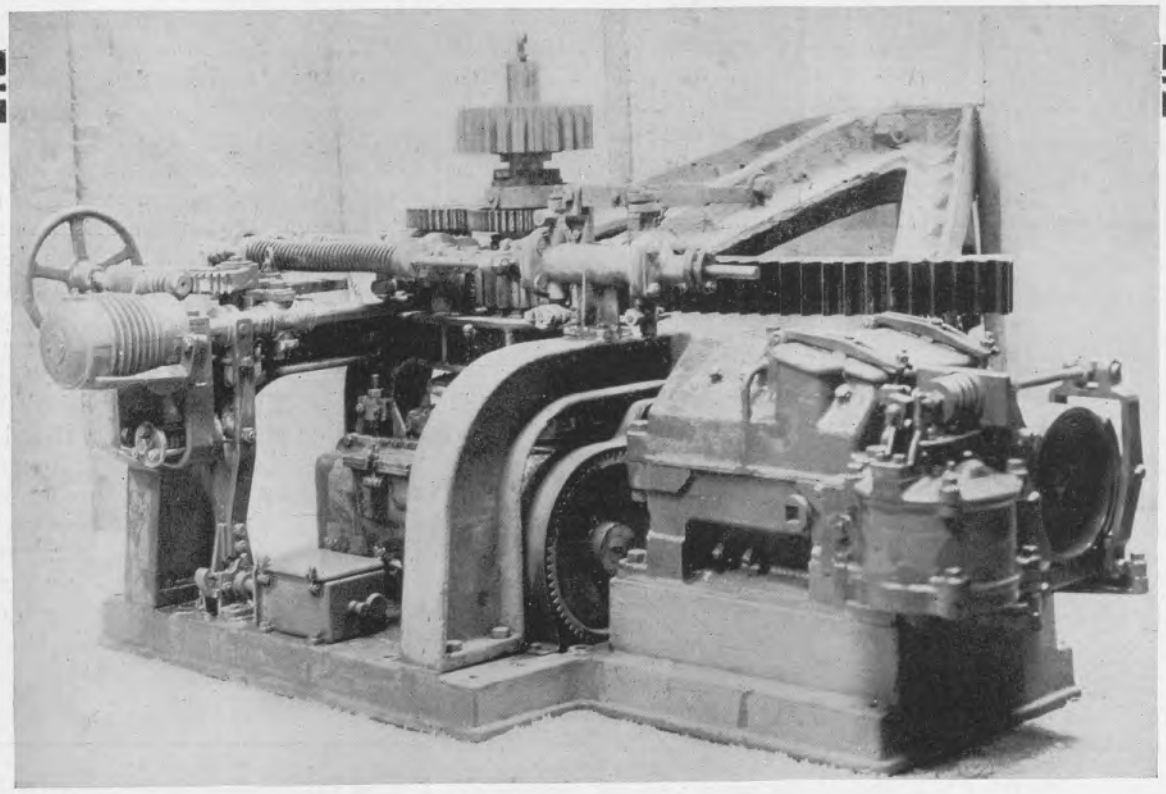
An idea of the engine-room machinery arrangement for a complete conversion is given in Fig. 1 and a partial conversion in Fig. 2. Fig. 1 is an engine-room arrangement suggested by the McIntosh & Seymour Corporation, in which no steam auxiliaries are used. As previously stated, this is by far the most desirable arrangement from the operating point of view, but is considered eliminated from present consideration by the high first cost. Fig. 2 shows the compromise arrangement we have discussed, whereby the steam auxiliaries may be used in port and only electric auxiliaries used at sea. It will be noted that the location of some of the steam units is far from ideal. Such of these steam auxiliaries as do not have to be moved in order to remove the old machinery and install the new, have been left in their original location in order to reduce the conversion cost. By slightly increasing this cost a more logical and symmetrical arrangement can be obtained.

## E. F. Hutton's New Diesel Auxiliary Yacht

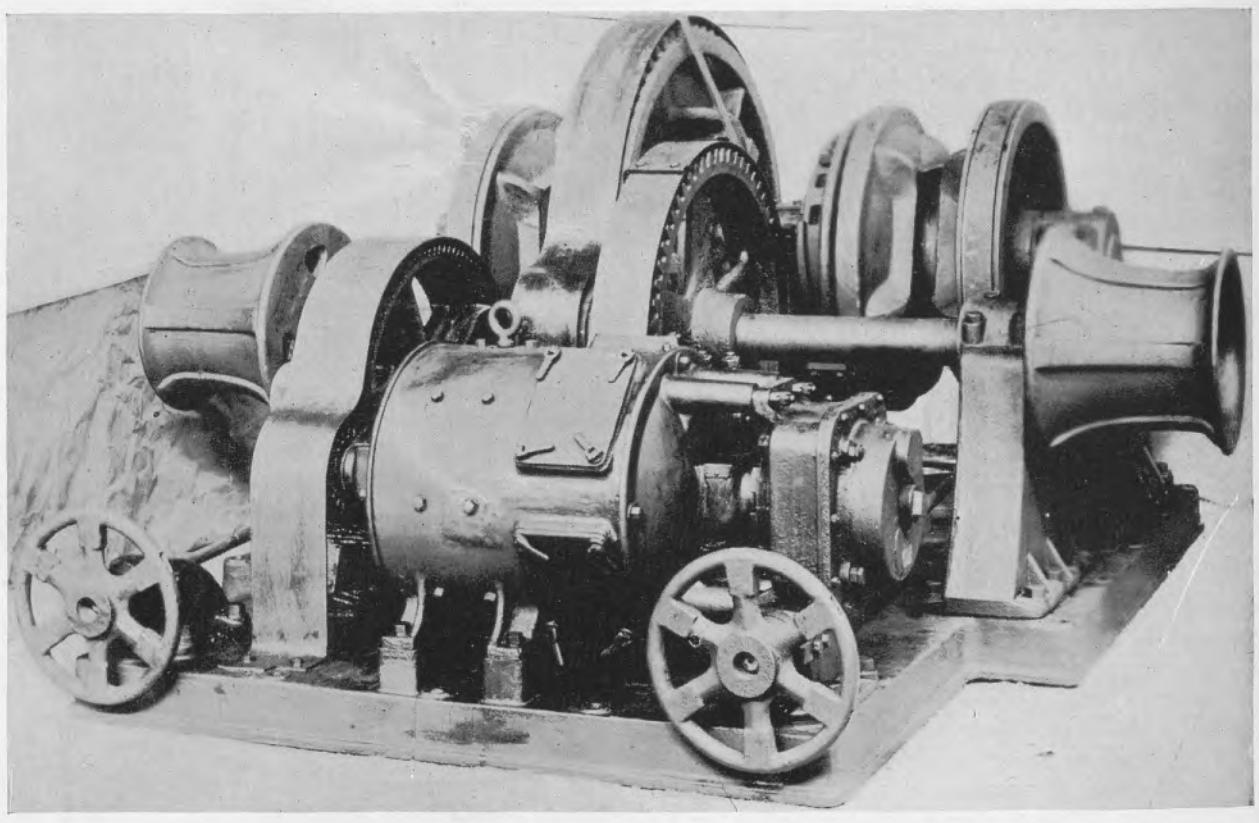
*(Concluded from page 634)*

having them built abroad. The owner's launch, which is fitted with a coupé body, is 28 ft. in length and has a speed of 15 knots; the crew's launch is 24 ft. in length and practically as fast as the owner's launch. In addition there is carried a 16 ft. working launch which can be used when the larger launches are not required.

The HUSSAR is a demonstration of what can be accomplished with care and thought by the use of a Diesel engine in an auxiliary vessel. The engine itself is scarcely noticeable and takes up little or no useful room. The fuel is carried in tanks entirely under the floor of the accommodations and in no way occupies useful space. The vessel has sufficient power to give at least as much speed without sail as is found in the conventional, full-powered steam yacht. On account of the size, character, and location of the machinery and the design of the propeller, the HUSSAR will handle as well under canvas as if no power were installed. In addition, she carries only a slightly larger crew than would be required for a sailing vessel of her size and type not having power installed. To have accomplished these results without the use of a Diesel engine would have been an absolute impossibility, and it is very interesting to contrast what has been produced in this new yacht with the accommodations and general qualifications of the older auxiliaries in which steam plants were installed. The success of this new craft is practically certain to result in other vessels of similar character being ordered in the near future.



Electrically driven Steering Gear and electrically driven Windlass as furnished for the new motor ships STEELMOTOR and STEELVENDOR.



Hydro-electric Steering-gears, electric-windlasses, electric-winches, electric-capstans for motorships a specialty.

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